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C. F. Hunt.

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ANNUAL REPORT

OF THE

COLUMBUS HORTICULTURAL SOCIETY

FOR THE

YEAR ENDING DECEMBER 31, 1905

COMPRISING

THE CONSTITUTION OF THE SOCIETY, LIST OF MEMBERS,
OFFICERS AND PROCEEDINGS OF THE MEETINGS,
TOGETHER WITH PAPERS AND DISCUSSIONS

EDITED BY
VERNON H. DAVIS
SECRETARY

⁂

COLUMBUS, OHIO:
PUBLISHED BY THE SOCIETY
1905

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Columbus Horticultural Society

1905

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HERBERT OSBORN	*Vice-President*
VERNON H. DAVIS	*Secretary*
GEO. W. SINKS	*Treasurer*

EXECUTIVE COMMITTEE

GEORGE W. GILL
J. WARREN SMITH
T. A. SCOTT

CHAIRMEN OF STANDING COMMITTEES

J. H. LAGEMANN	*Botany*
VERNON H. DAVIS	*Vegetable Pathology*
HERBERT OSBORN	*Entomology*
J. WARREN SMITH	*Meteorology*
T. A. SCOTT	*Fruits*
H. WARREN PHELPS	*Vegetables*
GEO. W. GILL	*Forestry*
S. C. DERBY	*Library*
O. E. JENNINGS	*Plants and Flowers*

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MEMBERS

Life—From Columbus

Aldrich, O. W.
Bradford, Mrs. Joseph.
Brenneman, Mrs. J. H.
Deshler, Wm. G.
Hardy, C. J.
Klippart, Mrs. J. H.
Lovejoy, Mrs. N. E.
Lazenby, Wm. R.
Lagemann, J. H.
Pugh, J. M.
Rodgers, A. D.
Sessions, H. M.

Life—From Abroad

Devol, W. S	Riverside, Cal.
Crawford, M	Cuyahoga Falls
Green, W. J	Wooster
Harrison, J. J.	Painesville
Scott, T. A	Westerville
Vergon, F. P	Delaware
Farnsworth, W. W	Waterville
Miller, Wm	Gypsum

Active—From Columbus

Bruning, Mrs. H. C.
Ballou, H.
Bloomfield, L. M.
Delmers, Miss Freda
Derby, S. C.
Davis, V. H.
Gill, Geo. W.
Hine, J. S.
Jennings, O. E.
Knopf, Albert.
Lofland, Mrs. J. P.
Mills, W. C.
Osborn, Herbert.
Phelps, H. W.
Price, H. C.
Rownd, R. M.
Sperry, F. P.
Spahr, Geo. T.
Sutton, L. K.
Smith, J. Warren.
Vivian, Alfred.

Active—From Abroad

Alspach, Clinton	Camp Chase
Beattie, W. R	Washington, D. C.
Boardman, J. D	Worthington
Bogue, E. E	College Station, Mich.
Cotton, E. C	Shreveport, La.
Dill, F. P	Westerville
Detwilder, Daniel	Canal Winchester

DICKEY, C. L	Worthington
DAY, A. E	Mt. Carmel
DAVIS, A. S	Worthington
DITTO, T. W	Delphos
EVERAL, J. W	Westerville
GAYMAN, MISS ELIZA	Canal Winchester
HAYWOOD, JOHN	Westerville
HOLT, S. R	Worthington
HUNT, T. F	Ithaca, N. Y.
JENNINGS, O. E	Pittsburg, Pa.
LEHMAN, ISAAC	Canal Winchester
LENTZ, H. P	Basil
LUKE, F. K	St. Louis, Mo.
McFADDEN, L. H	Westerville
PHINNEY, MRS. T. O	Clintonville
SELBY, A. D	Wooster
SCHOTT, S	Lancaster
SHARP, C. E	Westerville
SHARP, MRS. C. E	Westerville
TUSSING, R. J	Canal Winchester
THORNE, C. E	Wooster
WARREN, E. G	Hilliards
WERNER, WM. C	Painesville
WEBSTER, F. M	Washington, D. C.
WETHERALL, J	Camp Chase
WHITNEY, W. C	Westerville

CONSTITUTION

NAME AND OBJECT.

SECTION 1. This Society shall be known as the COLUMBUS HORTICULTURAL SOCIETY.

SEC. 2. The object for which it is organized is the advancement of horticultural knowledge.

MEMBERSHIP.

SEC. 3. Any person may become a member of the Society by the payment of one dollar. Wives and daughters of members shall be members without the payment of any fee. Male members shall pay an annual fee of fifty cents, in advance, which shall be for the year ending with the next succeeding annual meeting; and no member shall have the right to vote, or other privilege of membership of the Society so long as such annual fee shall remain unpaid. Any lady resident in Franklin County may become a member without any fee.

SEC. 4. Any person may become a life member of the Society upon payment of ten (10) dollars, which shall be in lieu of all assessments or annual dues; and all persons who have been members for twenty or more years and have paid their regular dues, shall be life members.

SEC. 5. Any person distinguished in horticulture, upon the recommendation of the Executive Committee, may be elected an honorary member of the Society by the affirmative vote of two-thirds of the members present at any regular meeting. Honorary members shall not have the right to vote nor incur any of the liabilities of members, but they shall be admitted to all meetings and exhibitions of the Society.

OFFICERS.

SEC. 6. The officers of the Society shall be a President, Vice-President, Secretary, Treasurer and an Executive Committee of three members, all of whom shall be eletced by ballot at the annual meeting in December, and shall serve until their successors are elected.

SEC. 7. The President, or, in his absence, the Vice-President, shall preside at all meetings of the Society and of the Executive Committee. In the absence of both, a President *pro tem.* shall be appointed.

SEC. 8. The Secretary shall keep a record of the proceedings of the Society, edit the same for publication, prepare a suitable program for each regular meeting, and attend to all necessary correspondence. He shall also receive all moneys due the Society for membership, annual fees and assessments, and pay over the same to the Treasurer; and shall receive as a remuneration for his services the sum of fifty ($50.00) dollars per year.

SEC. 9. The Treasurer shall receive from the Secretary all money and funds belonging to the Society, and shall be the custodian of all bonds, stocks and securities belonging to the Society, and shall pay out and transfer the same only on the order of the Society, certified by the President and Secretary; and he shall keep an account of the receipts and disbursements, and report it to the annual meeting; and shall give such bonds as the Executive Committee may require.

SEC 10. The Executive Committee, including the President and Secretary *ex officio*, shall have control of all exhibitions, and have a general supervision of all matters pertaining to the welfare of the Society. It shall have power to call special meetings whenever, in its judgment, it shall be necessary.

SEC 11. The chairmen of the standing committees shall be elected at the annual meeting, and such chairmen shall have the power to appoint the other members of their respective committees.

SEC. 12. The following standing committees shall be elected:

1. On Botany.
2. On Vegetable Pathology.
3. On Entomology.
4. On Meteorology.
5. On Library.
6. On Fruits.
7. On Plants and Flowers.
8. On Vegetables.
9. On Forestry.

INVESTMENTS.

SEC. 13. The Executive Committee shall make and manage all investments. No investment shall ever be changed without the recommendation of said committee, approved by two-thirds each of the members and life members of the Society; nor shall the present invested fund of the Society ever be reduced in amount; but if it should become so by any unavoidable cause, the income shall be invested until the full amount is restored.

SEC. 14. The funds of the Society shall be invested in the bonds of the United States, the State of Ohio, the City of Columbus, or Franklin County, Ohio; or in loans at not exceeding the legal rate of interest in the State of Ohio, payable semi-annually or annually, and secured by first mortgage on unencumbered real estate, situated in Franklin County, Ohio, of the value of twice the amount of the sums loaned thereon, exclusive of buildings and improvements.

AMENDMENTS.

SEC. 15. This Constitution may be amended at any regular meeting of the Society by a two-thirds vote of the members present: Provided, due notice of such proposed amendment shall have been given at least one week before such meeting.

BY-LAWS

ORDER OF BUSINESS.

SECTION 1. The following shall be the order of business at every meeting, unless changed at the time by the vote of the meeting:

1. Reading the minutes of the preceding meeting.
2. Unfinished business.
3. Election of members.
4. Reports of special committees.
5. Reports of standing committees.
6. Communications and correspondence.
7. Regular papers or addresses and discussion.
8. Miscellaneous business.
9. Adjournment.

TIME OF MEETING.

SEC. 2. Regular meetings shall be held some time during June, October and December, the exact date to be fixed by the Executive Committee. The meeting in December shall be the annual business meeting.

UNIV. OF CALIFORNIA

Columbus Horticultural Society

JANUARY MEETING.

At the annual meeting for 1904, held December the 10th, the executive committee of the Society was instructed to bring in a report on plans for the year of 1905.

The committee reported as follows:

Your committee to which was referred the question of change in the number and character of the meetings and the publications of the Society beg leave to report as follows:

(1) We recommend that instead of meeting each month for ten months of the year, there be held three meetings annually; one in early June, one in October, and one in December, which shall be the annual business meeting. That for each of these meetings the Secretary prepare a good program, consisting of two or more carefully prepared addresses or papers, and a short list of timely topics for discussion.

The chairman of each standing committee is expected to prepare a report for each meeting.

In connection with the above program it is recommended that an exhibition of such fruits and flowers as are seasonable be held, and that for such exhibits suitable premiums be offered, and the coöperation of the Columbus Florists' Society be invited.

(2) In view of the certain decrease in the income from the invested funds of the Society, we recommend that the proceedings be no longer published in the form of a quarterly journal, but in an annual volume, to be issued at as early a date as possible after the annual meeting in December.

We recommend that the Secretary have a report of the proceedings of the June and October meetings published in the city papers and that slips or proof sheets be sent to all members, to different horticultural societies, and to various argricultural and horticultural journals.

(3) In view of the illness of Mr. Geo. W. Sinks, who has served the Society as Treasurer for so many years, we recommend that Mr. H. L. Thomas be made Assistant Treasurer.

(4) We further recommend that, inasmuch as "local sections" of our Society are no longer recognized, that the Constitution be amended by striking out all reference to said local sections.

After considerable discussion the above report of the Executive Committee, with its recommendations, was unanimously adopted.

Mr. W. W. Farnsworth, of Waterville; F. P. Vergon, of Delaware, and William Miller, of Gypsum, were made life members of the Society for their distinguished services to horticulture.

The Secretary was instructed to place the names of Wm. R. Lazenby, A. D. Rodgers and any others in the active membership list, who had regularly paid dues for twenty years on the list of life members.

Geo. W. Sinks and J. H. Lagemann were made life members for valuable services to the Society.

Mr. H. L. Thomas was elected to membership and made acting treasurer of the society.

The following resolution introduced by H. Warren Phelps, was unanimously adopted:

> Resolved, That the Columbus Horticultural Society approves the general purpose of the Park Commission in its effort to extend and improve our city park areas, and that we appoint its President, William R. Lazenby, a committee of one to represent the Society, and coöperate as far as possible with said commission in its work.

Prof. J. H. Lagemann reported considerable damage done to fruits, flowers and birds by squirrels. He said in part: "The squirrels, petted, fed and protected by the people of the city, are proving their ingratitude by pilfering habits of a very harmful character. One day last summer I saw a squirrel in my sweet cherry tree and at the same time noticed that the cherries were falling one after the other. At first I thought it was searching for the seeds of the wilted cherries, but soon found out that it was the ripest and best specimens that were rapidly being devoured. The squirrel persisted in returning day after day until the cherries were all gone. Next, the early pears were attacked and perhaps a half-dozen in a single morning would be thrown down, bitten on one side, before one would be found to its taste. Early apples were attacked in the same manner. So it went on throughout the summer. I am sure that squirrels are our greatest spoilers of flowering underground bulbs, and also of leaf and flower buds. They also crack the heads of young birds in the nests and in this way are largely responsible for the decreasing number of our song birds. This important matter should be brought to the attention of the public and our city council for their consideration."

President Lazenby gave a report of the meeting of the "American Apple Growers' Congress," which he attended as a delegate of the Society. He also reported the meeting of the American Pomological Society, held in Kansas City, which meeting he also atended as the Society's delegate.

The Society adjourned to meet at the call of the executive committee.

THE AMERICAN APPLE GROWERS' CONGRESS.

WILLIAM R. LAZENBY.

The last annual meeting of this business-like congress was held on the World's Fair Grounds, St. Louis, November 9, 10 and 11.

An excellent program had been prepared and with slight variations was carried out during the three days of the meeting.

The attendance was not large, but was made up mainly of successful apple growers and others in the front rank of horticulturists.

In proportion to the whole number present Ohio was well represented. President W. W. Farnsworth and Vice-President U. T. Cox of our State Horticultural Society, Director C. E. Thorne, W. I. Chamberlain, F. H. Ballou and W. C. Mills were seen by the writer. Perhaps there were others.

The object of this association, as its name indicates, is to study and learn, as much as possible, about methods of culture, how to meet injurious fungi and insects, and how to best dispose of the apple crop.

It is naturally a live, wide awake societv, because nearly every member is interested financially in the subject. I did not hear all of the papers and discussions, but those I did hear contained much sound, practical advice, although little that was new.

The apple curculio came in for a good share of attention, and it seems to be a serious enemy in many sections of the West.

Prof. Crandall, of the University of Illinois, gave the summary of the experiments he had been making for the past two or three years. He emphasized the value of shallow cultivation during the period of pupation, regarding this as the best remedy.

Under the subject of packing apples for market the comparative and relative merits of box and barrel were considered at some length.

For choice, well assorted varieties for local or special markets, the box appeared to be in favor, but for the average, ordinary crop, especially for long distance shipping the standard barrel is still considered the most practical package. The more common use of baskets of various sizes for the convenience of retailer and purchaser was urged bv several members.

Instead of repacking or adding more apples to a barrel, when from shrinkage or other cause the apples become loose, or slack, several members had used a cushion, or filled the space in one end of the barrel with excelsior or some similar material. This practice was highly commended by those who tried it.

Perhaps the two most important papers to the large growers was one on "Foreign Markets," by W. A. Taylor, assistant pomologist of the United States Department of Agriculture, and one on "Government Inspection of Apples," by Mr. Alec McNeill, of Ottawa, Canada. These papers were interesting in showing the remarkable development of our foreign trade in apples, and pointing out what should be done in order not only to hold, but to stimulate and increase this trade.

Mr. McNeill gave an interesting account of the origin and fully explained the workings of the Canadian "Fruit Marks Act" of 1901. This act puts a virtual end to the use of fictitious brands, by requiring the name and address of the responsible shipper to be placed on every barrel or other closed package. Each package must also bear a distinct grade mark, "No. 1 or XXX," "No. 2 or XX," "No. 3 or X," and the buyers and public are safeguarded by the fixing of a standard for the first grade as follows:

"Such fruit must consist of well grown specimens of one variety, sound, of nearly uniform size, of normal shape, of good color for the variety, and not less than 90 per cent. free from scab, worm holes, bruises and other defects, and properly packed."

Then follows a most important provision against overfacing, which makes it an offense to pack or sell any package of fruit, more than 15 per cent. of which is substantially inferior to the shown surface. This in brief was the remedy for the most glaring abuses in the apple trade, an abuse which we were told bid fair, unless checked, to demoralize, if not completely break down, the Canadian foreign apple trade.

How is this law operated so as to be effective? The machinery is something like that of our "pure food" and "fertilizer" laws. It consists of a staff of inspectors, some traveling, some stationed at the principal points of export, and all endowed with large powers, as defined by the act. They are authorized to enter any premises, storehouse, or cars, at any time to examine fruit which they have reason to think may be falsely marked or packed. A guiding principle throughout the inspection work is that the trade shall be disturbed as little as possible. It was therefore the practice during the first two years of the operation of the act, to make its administration largely educational. Packers and shippers were written to once or oftener, advising them as to which of the provisions of the law had been violated and they were informed how they might comply. Only in case of persistent infractions, or systematic attempts at fraud, were prosecutions entered upon. Now, that the law and its operations are well known, it is being more and more strictly enforced.

According to Mr. McNeill, the results of this policy have been more than gratifying. It has placed Canadian fruit in a most favorable position in foreign markets. Confidence is being restored, and not alone the export but the home trade as well has been wonderfully benefited.

I did not hear all the discussion on this paper, but I judge from what I did hear that the growers, shippers and consumers of apples in the United States are satisfied that the grading and packing of fruit is not what it ought to be. I am not sure that any action was taken but it seems to me that such organizations as the Apple Growers' Congress, and the American Pomological Society can devise some national or general state plan for the grading and packing of fruits for export and interstate shipment.

If my memory serves me a committee on this subject, of which Mr. C. H. Williamson, of Quincy, Ill., is chairman, was appointed at the last meeting of the American Pomological Society, and I imagine the Apple Growers' Congress will aid in this matter. Oranges are carefully graded and packed; why should not apples be uniformly treated in the same way?

REPORT OF THE AMERICAN POMOLOGICAL SOCIETY.

WILLIAM R. LAZENBY.

The twenty-ninth biennial session of this well known society was held in Kansas City, Mo., September 19 to 21, inclusive.

Although fairly well attended, something of the oldtime enthusiasm was lacking, and the meeting was less inspiring than usual. There were some reasons for this. In the first place, the meeting was postponed from August to September, and this prevented many of the members who had large crops of orchard fruit to care for, from attending, and kept many away who are engaged in college or university work.

In the second place, an unprecedented September rainfall so flooded the northern part of Missouri that for several days just prior to, and including the opening of the meeting, all travel by rail was at a standstill. This affected the attendance to such an extent that the number of certificates requisite for the ordinary reduction in the railroad rates was wanting, and delegates had to pay full fare each way. This was an equal dissappointment and hardship. Perhaps it was unavoidable, but when assurances have been given that reduced rates have been secured, it is rather tough to be "held up" for full fare. Another disappointment that had its effect upon the meeting was the absence of President Hale, of Connecticut, and Vice President Garfield, of Michigan. Although Colonel Watrous, the ex-president, presided in his usual efficient manner, the members could not refrain from wishing that Hale and Garfield were there. When the society was first called to order, Secretary Barnes, of Kansas, on behalf of his State Horticultural Society, presented the chairman with a gavel for use during the meeting, made from a pear tree planted by Marshall P. Wilder, the first president and generous patron of the society, whose name is known and honored by horticulturalists the world over. The usual words of greeting were extended by

Mayor Neff, of Kansas City, and Senator Dunlap, of Illinois, and were responded to in a most felicitous manner by that old veteran, Parker Earle, of New Mexico.

Secretary Craig presented a short report in which he stated that the society lacked but two of having 200 life members, and had nearly 400 biennial members. He claimed that each volume of the reports is more valuable than those preceeding it. If this statement continues to hold true, Secretary Craig will be obliged to show remarkable progressive talents as a compiler of the annual report. The standard set by the proceedings of the Boston meeting of 1903 will be somewhat difficult to improve upon.

I shall not take the various papers and discussions that followed in their order, but present some of their more salient points noted during the progress of the various sessions.

Two papers, one by Albert Dickens on "American Plums in Kansas," and the other on "Marketing Plums," by F. H. Marshall, gave some good points and elicited consderable discussion. The native American plum as it is found growing in Kansas, needs no apology. It is a sure cropper, a fine cooker, and a good all-around plum. The Wyant has also proved worthy in many places.

Prof. S. B. Green recommended the Surprise as one of the most valuable plums for the northwest. He said that in his opinion it stood at the very head of the list for planting in Minnesota. This was corroberated by others who did not hesitate to say that they consider the Surprise the best plum that they now have. In Texas the Japanese plums do well and some experiments with crossing the native and European varieties with the Japan have given good results. Some of these crosses are particularly fine, of good size, attractive color and excellent quality.

T. V. Munson had experimented with plums extensively and finds that many of the Americans winterkill. The Newton plum is one of the best of this class. The Miner plum can also be highly recommended. They do not winterkill and some are nearly perfect in fruiting qualities. Among the Japanese plums that do especially well in Texas are the following: Red June, Abundance, Burbank, Normand and Chabot. America is fine colored, prolific and of good quality. It resembles Gold but is not so high colored. As a rule plums of the European class are a failure in Texas. The same report was made of the Japanese plums in Kansas. They are not well adapted to the climate.

W. S. Coburn, of Colorado, stated that all plums are successfully raised in Western Colorado, while the eastern slope raises the natives almost exclusively. As a rule the market for plums is unreliable except for canning. Colorado apples packed in neat bushel boxes, brought from $2.50 to $4.00 a box.

The discussion of varieties seemed to emphasize the fact that the question of adaptibility of varieties is an all-important one, and that each grower should by observation and experiment learn what varieties will do well in his particular section of the country.

Chairman Watrous thought it much easier to adapt a southern variety to northern climates than the reverse.

Before leaving the subject of varieties it may be well to report that a persistent effort was made to get the society to endorse the Ben Davis apple.

The question came up in one form and another, again and again. While some of the claimants for the Ben Davis were undoubtedly honest, it was plain to be seen that others stood for the baldest commercialism. Fortunately, the act and good sense of the chairman prevented the society from committing itself to an inferior variety, which on merit alone can never hold its own with the spicy Jonothan, the sprightly Grimes or the racy Rhode Island Greening. Size, color and keeping qualities are unquestionable requisites of a good apple, but they are not the *only* requisites. To base any claim of perfection upon them may attract the undiscriminating and deceive the ignorant, but cannot promote the interests of true horticulture.

J. A. Burton, a successful apple grower of Southern Indiana, described his method of cultivating orchards. He uses the disk harrow, going once in each direction, taking pains to cover all the ground, and being equally careful not to injure the trees. He does not believe in late cultivation, for this not only prevents the proper development of the buds, but keeps the fruit from coloring as well as it would otherwise do. He deems it best to stop all cultivation by the middle of June at the latest. In his orchards the annual crab grass grows thriftily after cultivation ceases, and makes a good cover crop.

Mr. Burton was mildly criticised for using a more or less pernicious weed for his orchard cover, but he defended his practice, and said he would hold on to the crab grass until he found something better.

As might be expected, the subject of "spraying" called forth much discussion. The subject was opened by E. M. Pollard, of Nebraska, who expressed dissatisfaction with the old formulas and methods of application. He had often failed to secure good results, and sometimes his work was followed by more or less injury. Parker Earle was pronounced, not to say emphatic in advocating the use of arsenite of lead or disparene, It injures neither buds nor foliage, and is more adhessive and lasting than bordeaux mixture. It was the most effective and safest spraying poison he had ever used. As the old formulas are uncertain in their effect, why not throw them all aside and use something that is equally safe and effective? He had used arsenite of soda, and had done much damage to foliage.

The price of arsenate of lead is .15c per pound for 100-pound bags. Three pounds to fifty gallons of water is the right proportion. The directions for using are so simple that a mistake is scarcely possible.

Some members reported that they got just as good results with arsenite of lime and arsenite of soda which are much cheaper. All agreed that the first and most thorough application should be made before the leaves are out.

For the San Jose scale, especially on peach, nothing better has yet been found than the lime and sulphur wash. It may be safely applied on any dormant woody tree or shrub. The trouble of preparation is the greatest drawback to general use.

The session of Wednesday evening was devoted to fruit growing, historically considered, in some of the states west of Missouri. The states described were Arkansas, Kansas, Nebraska, Colorado, New Mexico, Oklahoma, Texas and Missouri. Kansas and Missouri had the largest commercial orchards, the former state having 240,000 acres devoted to fruit trees. The geographical position of Missouri together with the geological formation along the rivers, and the red clay shale of the Ozark region make it one of the leading fruit states of the union. In the Ozark region there are more than 100,000 fruit trees and 7,000 acres of strawberries.

The trials and triumphs of other states were recounted in glowing terms and while commercial orcharding is not so far advanced as in the other states just named, home planting and small commercial orchards are rapidly increasing.

In the great state of Texas, according to Prof. T. V. Munson, commercial fruit growing has mainly developed during the last quarter of a century, but it is now making rapid strides. In future years this state is likely to astonish the world in the variety and extent of her horticultural products.

Among the many interesting historical facts presented by the representatives of these different western states, one stood out with unusual clearness and that was the great influence of the various state and local horticultural societies in promoting the horticultural interests and in developing the fruit growing possibilities of these several states.

These societies have been a power in the development of their respective states, and it is gratifying to note that the value of their work is known. Their rank and standing as state organizations are assured; their support is liberal and generous.

One of the most interesting addresses was by ex-President Watrous on "Observations of an American on Japanese Horticulture." Among other things the writer said it had been the dream of his boyhood to visit the Orient, and it took sixty years for the dream to come true. A long time, but the wider vision, and enlarged capacity for observation and pleasure, made the waiting well worth while.

The amount of tillable land in Japan is so limited that the proportion to each individual is small. The average American would not be content to live as do the Japanese. As a rule only enough is produced to sustain life, and this is only maintained by hard toil, the plainest food, and the most pinching economy. Every foot of ground is cultivated in order to secure the bare necessities of life. They have no orchards as we have, and cultivate dwarf fruit plants for their blossoms rather than fruit. They practice many novel and curious forms of horticulture and show equal skill and sympathy in dealing with plants.

Of the fruits of Japan, the persimmon is the only one we can satisfactorily import. The empire of the Japan plum is in America and not in Japan.

While the fruit exhibit at the Kansas City meeting was less extensive and varied than that of the Boston meeting of two years ago, it was a grand display of the fruits of the west. Over 1600 plates, besides numerous packages, and exhibits in bulk, were displayed. Florida had a large exhibit of tropical and semi-tropical fruit. Alabama had a bewildering collection of persimmons, both native and Japanese. Colorado and other states showed exhibits side by side of fruit from irrigated and non-irrigated land. To exemplify the evolution and development of cold storage, Missouri had fruit of the crops of 1903, 1904 and 1905, all in excellent condition.

One of the largest individual exhibits was that of pears by Ellwanger & Barry, of Rochester, N. Y., which included 124 distinct varieties.

It may not be generally known that Marshall P. Wilder, who served the Pomological Society as president for the first twenty-five years of its existence, left a bequest of one thousand dollars, the income of which shall be from time to time offered in Wilder medals for objects of special merit. Mr. Wilder also bequeathed the further sum of four thousand dollars for the general purpose of the society.

The income from this endowment, together with the dues of life and biennial members, furnishes a sum sufficient to meet the expense of publishing the "Proceedings" of the biennial meeting, and an occasional special paper.

In the election of officers there was a sharp, but good-natured rivalry between Secretary L. A. Goodman, of the Missouri State Horticultural Society, and Prof. T. V. Munson, of Texas. The former was elected president and the latter was made first vice president.

Your delegate received the compliment of being elected vice president for Ohio.

SUMMER MEETING—SIXTIETH ANNIVERSARY.

A joint meeting of the Ohio State Forestry Society and the Columbus Horticultural Society was held in Townshend Hall, Ohio State University, Saturday, June 10, 1905.

President Lazenby (President of both Societies), called the meeting to order at 10 o'clock a. m., and after a few remarks announced the following committees:

On Membership, Professor Herbert Osborn and C. H. Flory of Columbus, and H. L. Goddard of Wooster; on Exhibits, C. W. Waid of Wooster, and James McOwen and Miss Freda Detmers of Columbus; on Entertainment, J. S. Hine and V. H. Davis of Columbus and L. H. McFadden of Westerville.

The entire morning session was devoted to the State Forestry Society, and the following program was carried out in full:

Address, by Governor Herrick.
Timber Trees of Ohio—C. H. Flory.
Forestry from the Farmers' Standpoint—L. B. Pierce.
Distribution of Forest Trees—C. A. Miner.
Insect Enemies of the Locust—E. C. Cotton.

In addition to the regular program the following questions were discussed as time permitted:

1. What are the most important forestry problems in Ohio?
2. What are the comparative merits of the yellow locust and hardy catalpa for general planting in Ohio?

3. What is the best way to regenerate the neglected and abused woodlands still left in Ohio?

4. Which are the best trees for roadside planting?

5. How can Arbor Day be made more useful in the cause of forestry?

Luncheon was served at the University at 12:30, after which the campus and gardens were inspected under the direction of Professor Lazenby?

At 1:30 the Columbus Horticultural Society held its sixtieth anniversary, which meeting proved to be one of the most interesting and important in the history of the society.

Chief interest centered in the "Brief History of the Columbus Horticultural Society," which was offered by President Lazenby. In addition to this paper the following program was carried out:

Letters and Reminiscences by Older Members.

Influence and Benefits of Horticultural Societies—W. W. Farnsworth.

Insect Enemies of Greenhouse Plants—Ira J. Condit.

Experiments with Cover Crops—N. E. Shaw.

Insects Injurious to Stone Fruits—L. M. Smith.

The following questions were briefly discussed as time permitted:

1. Is it advisable to plant peach orchards in central and southern Ohio?

2. What legislation is needed to promote the best interests of horticulture in Ohio?

3. Is the "Sod Mulch Plan" of treating orchards the best for Ohio, and what are its limitations?

4. What can American horticulture learn from Europe?

5. Are the climate conditions of Ohio growing more or less favorable for the production of fruits?

The Columbus Horticultural Society offered the following premiums to members, or to any one who would pay the membership fee of $1.00.

	First Prem.	**Second Prem.**
Best display of apples, not less than five varieties	$2 00	$1 00
Best display of strawberries, not less than one quart of each variety	2 00	1 00
Best display of new varieties of strawberries	2 00	1 00
Best display of cherries	2 00	1 00
Best display of roses	2 00	1 00
Best display of cut flowers, not including roses	2 00	1 00
Best bouquet of wild flowers	2 00	1 00
Best display of garden vegetables	2 00	1 00

The displays of vegetables, flowers and some fruits was excellent and aroused a great deal of interest both among the exhibitors and others present. The report of the awarding judges will be found elsewhere in this volume.

GOVERNOR HERRICK'S ADDRESS.

The rapid and wanton destruction of our forests has been one of the crimes of our national life. If this is not checked, our beautiful forests will soon disappear. The protection of our forests appeals both to sentiment and commerce, to beauty and utility. It is estimated that if this destruction is continued at the same rate as in the past the forests of the United States will have disappeared. This would be a national disaster.

Aside from the importance of forest preservation, for its effect upon the climate and the conservation of water supplies, no material other than the food products is so indispensable to the life and happiness of a people as wood. More than one-half our houses are built of wood, and nearly all our furniture. It is said that about two-thirds of the people still use wood for fuel. In the process of mining a hundred tons of coal, two tons of timber are necessary. Our railroads require seven hundred millions of wood ties and run over more than two thousand miles of wooden bridges and trestles. The number of telegraph and telephone poles required by the needs of the present is not less than twenty millions annually. Professor Fernow is authority for the statement that each family in the United States uses on an average "about two thousand cubic feet, or eighty thousand pounds of dry wood every year—the *annual* product of at least fifty acres of forest." While these figures are startling, they do not begin to show our dependence upon the forests. The development of the cellulose and wood pulp industries, the use of nearly two million cords of tanbark each year, the need of large forests to supply turpentine, resin and tar, the production annually of fifty million pounds of sugar and five million gallons of syrup from maple trees, all emphasize the importance of forest preservation. The requirement of wood pulp with which to make the paper for our newspapers and periodicals is in itself sufficient to demand our serious thought.

A continuance of the wasteful practice of devastation that has been followed for years, without any attempt to build up our forests, will force a very serious problem upon the generation to follow us. I noticed recently while passing through the Indian Territory, evidences of what was seen here in the early days—great, noble trees with the girdle of the axe about them, killed, not for the manifold uses the wood might be put to, but simply because the landowner wanted to get rid of them. This, too, was in a section of the country where there is a scarcity of timber. I might say, that the girdling of trees in this manner prevents the tree putting forth its foliage in the spring, which would shade the ground, and by this means the unwise and indolent farmer is enabled to raise a crop the first year of his tenancy. It seemed to me, when, as a boy I was familiar with such sights in our then well-wooded country, that the destruction of a forest tree by girdling it and leaving it to die, with no use to be made of the wood, should be dealt with as a crime. President Roosevelt, speaking of the man who does such things, says, "That man is a curse and not a blessing to the country."

In this forestry policy upon which the country is entering, sentiment and commerce go hand in hand. The proper working out of this policy is the only way in which we can perpetuate the lumbering industry of our country. The great system of irrigation upon which the people of the West are so intent can be brought to its highest perfection only by the contemporaneous working out of the forestry problem. The forests are necessary to prevent the soil washing and filling the storage reservoirs, as well as to conserve the water supply itself. Forest preservation is not incompatible with extensive lumber operations. It teaches the lumberman how properly to use the forests, and at the same time to permit nature to re-create them.

The older nations of the world were long ago brought to realize the evils resulting from forest destruction and waste, and laws for prevention and rehabilitation were enacted. We would do well to consider the methods employed by them, and the great benefits resulting therefrom. In France, under a law passed in 1882, the government may force any owner of mountain or desert land that has become denuded, to plant trees upon it. That law has resulted in great good. I know of one great forest in Germany where by the systematic care of trees they are enabled to take away a large amount of timber, as I recollect it about five per cent of the forest area—and this is re-grown each year.

The forests of a country alone serve the useful purpose of wind-shields, and prevent the fierce and destructive cyclones and wind-storms that are common to those sections where there are few trees. They are also useful in the prevention of floods, by holding back and graduating the water supplies. It is contended by many high authorities, that the great floods on the Mississippi in late years were due to the obliteration of the forests along its tributaries.

In my last inaugural address to the General Assembly, I recommended the enactment of a law in the interest of forestry. There did not then appear a practical way of working out a policy for the State. It has since occurred to me to suggest that a department of forestry could be economically and advantageously administered by being combined with the Fish and Game Commission, which in many ways is a kindred department, and destined to become a still more important State department.

The important place that the horticultural societies have taken in the development of our State has led to state aid in the encouraging of this most necessary auxiliary to state administration. It shall be my aim and purpose to encourage the enactment of such laws as will further the development of this all-important work.

WHAT BUGS COST.

According to the Bureau of Agriculture bugs eat up annually more than it costs to maintain the government, including what we pay for warships, for the navy and the army, the Philippines, and the Panama canal. Here is what we annually lose by bugs:

Fruits	$ 27,000,000
Grains	200,000,000
Truck crops	53,000,000
Forests and forests products	111,000,000
Hay and forage	53,000,000
Tobacco	5,300,000
Cotton	50,000,000
Sugars	5,000,000
Miscellaneous crops	5,800,000
Animal products	175,000,000
Products in storage	100,000,000
Total	$785,100,000

TIMBER TREES IN OHIO.

CHAS. H. FLORY.

As a timber producing state, Ohio ranks seventh in the union.

From the rapid increase of argicultural lands within the last fifty years, one is inclined to think that our forests had long ago ceased to be an important economic resource. And yet, lumbering at present, taking into consideration the manufactured product, ranks probably fourth in importance of our great industries.

In comparing the present forest area of the State with that a few years ago, and the rapidity with which the forest growth is being cleared away, we are somewhat surprised at the above proportions.

According to the Ohio reports for the year 1853, there were over 13,900,000 acres of forest within the state; in 1870 there were approximately 9,700,000; in 1881 it had decreased to a little over 4,700,000, and at the present time there are only 2,500,000 acres—a decrease in fifty years of from 55 per cent. of the total area of the state to less than 10 per cent. at present.

At the same time the use of wood per capita is constantly increasing in spite of the substitutions of iron, steel, concrete, etc., that are constantly being made.

However, one must not lose sight of the fact, that, even if our timber is being rapidly removed trees are continually growing. The younger growth gradually reaching a marketable size, and the cut over areas, where not pastured too heavily or allowed to be run over by fire, are being slowly reforested from seedlings and to some extent by second growth from the stumps of old trees.

The timber trees of Ohio belong essentially to the hardwood or broad-leaf class and are an excellent representation of the Atlantic type of forest.

The soft woods or evergreens, such as the pine, spruce, hemlock, etc., are conspicuous by their absence, only occuring as scattered individuals over very limited areas, and hence are not considered of importance as timber producing trees in the state.

Of the hard woods, however, Ohio possesses a variety of species and number of individuals second to none in the union.

The richness of soil, the great river systems, the moist climate and absence of any great extremes of temperature, and the same general altitude have produced an abundant and vigorous growth of nearly all the valuable woods of the eastern United States.

Recently the United States Bureau of Forestry published a list of 500 differnt species of trees as being the total number found within our borders. Of this list fully 160 have been reported from Ohio, and of this list about 100 can be considered as timber-producing trees.

First in value, quantity, and number of species stand the oaks, of which there are fifteen. The white oak at present heads the list of most valuable trees in the State. In fact it is the most valuable and largest used of any of the hard-woods in the United States. Lumbermen are united in stating that the best white oak which they use is not shipped in from other States, but grows right here in our own wood-lots. Of the other important oaks the red, burr, scarlet, yellow, pin, swamp, and chestnut oak may be mentioned.

Next in importance from point of value come the ashes, with five species—the white, black, red, green and blue. The white easily stands first. With this species several of the others are generally confused on the market.

Next in value probably stand the hickories, represented by eight species, just two less than the total number found within the United States.

The maples, including the boxelder, are another very important genus, which also contains eight species. Two, however, being somewhat shrubby and of no commercial importance.

The poplars are also well represented, seven to eight species being found.

Of the other important timber trees the following list somewhat in order of their value and use, may be mentioned: Elm, yellow poplar or tulip, chestnut, basswood, cucumber, sycamore, beech, honey locust, walnut, black cherry; birch, butternut, hackberry, buckeye, pepperidge, Kentucky coffeetree, liquidamber, ironwood, bluebeek, alder and willow, together with the rarer comifers, red cedar, white pine and hemlock.

Among the above species a great difference in distribution, numbers and habitat is found.

Some are more or less continuously distributed throughout the State. Thus the white elm, white ash and white oak can be found frequently and in nearly every county and township. Others, as the black ash, cottonwood, pignut hickory, basswood, etc., are scattered over more widely separated areas.

The trees most abundantly found within the State are the white ash, burr oak, white elm, sugar maple, scarlet oak, red oak, white ash, beech, shagbark hickory, sycamore, basswood and hackberry.

The product of white oak alone equals more than one-half of all the other species combined. The stumpage value per thousand feet for Ohio for this species ranks second highest in the United States.

The trees that are less abundant are the chestnut, silver maple, black cherry, black ash, yellow oak, cottonwood, pignut hickory, tulip, large-toothed poplar; while those least met with are the black gum or pepperidge, Kentucky coffeetree, white basswood, sweet gum, butternut, cucumber, persimmon, red cedar, white pine and hemlock. Some of these are seldom found and are often looked upon as purely accidental individuals.

Some trees seem to be limited in their range of distribution, due to climatic conditions, soil, elevation, etc. The sweet gum and white basswood are found abundantly southward along the Alleghanies, but thin out rapidly toward the Ohio river. The persimmon, sourwood, red birch and a few others are very abundant in southern latitudes, but are found only in the southern part of Ohio, rarely farther north than Franklin County. These species are probably limited to a large extent by climate; southern Ohio being about the northern limit.

On the other hand, most of the poplars, willows, the white pine, cedar and other members of the conifer group, occur only in limited sections, at the north and east, or upon the highest elevations, many times simply as shrubby or stunted individuals. These are northern-growing species or are inhabitants of high elevations, Ohio being their southern boundary.

The chestnut is limited by soil, and is found only in certain sections, principally the eastern, and exclusively upon sandy—never upon limestone soils. Others of our timber trees are less exacting, and will grow upon any kind of soil, depending upon their degree of adaptability and endurance.

Many of the trees mentioned have interesting habits of growth. Some are social and grow together in pure stand, as the beech and ash, often forming forests of considerable size; others always occur singly, mixed in with many other species, as the hackberry, basswood, black cherry, etc. We never hear of a hackberry or basswood forest. Still others, as the elm, sycamore, walnut, hickory, etc., may either occur singly or in groups in the general forest, but never forming pure stand to any extent.

In general our timber trees can be divided into an upland and a lowland or flood-plain forest, although both types frequently intermingle. The upland forest is usually represented by white oak, chestnut, red oak, chestnut oak, hard maples, birch, beech and some of the hickories, while the flood-plain is characterized by hackberry, elm, basswood, ash, cottonwood, walnut, sycamore, willows, boxelder, etc.

Many of our once abundant and valuable trees are fast disappearing on account of the great demand for them. The wild cherry, black walnut, butternut, tulip and cucumber have become very scarce indeed. In some places the ashes, hickories, white and red oaks are beginning to rapidly disappear. Some species that were once found within the State have almost entirely gone. The drying up of the tamarack swamps in certain parts has caused the disappearance of the larck, which inhabited them, and the increased clearing and draining of the land is having a telling effect upon the beech. They are gradually dying and one seldom walks through a wood-lot to-day without noticing the frequency of their "staghorn" tops.

Some of the trees which are rapidly decreasing in number and at the same time increasing in price, lend themselves easily to cultivation.

In this manner we can aid nature to a great extent in reforesting the denuded areas which are not taken up by agriculture.

There are thousands of acres of poor waste land in different parts of the State which; although they will not grow farm crops, if planted with the proper species will grow the finest kind of timber. If planted with certain oaks, white ash, hickory, chestnut, yellow locust, catalpa, and many other desirable timber trees, the profit will be much greater than that derived from farm crops grown on the land during the time required to produce a marketable tree, and with far less care and expense; besides many other advantages to the owner and the community.

Although our once extensive forests have been reduced more or less to wood-lots in order to make room for agriculture, yet if the remainder of the standing timber and the so-called "waste lands" be properly managed, we will continue to have a source of great supply.

FORESTRY FROM THE FARMERS' STANDPOINT.

BY L. B. PIERCE.

There seems to be an undercurrent of belief in every community that the farmer is to a considerable degree responsible for the conservation and maintenance of the timber supply. He is blamed if he gives a job to a portable sawmill, and the wise professors of universities and experiment stations issue with great solemnity and much verbiage the dictum that not less than one-tenth of the land should be kept in forests. They say nothing about the thousands of acres covered with city buildings, or the ten to twenty-acre factory sites, taking it for granted, apparently, that the farmer should be held for these also.

The fact is that the farmer is no more interested in the great general problems connected with forestry than the merchant, manufacturer or professional man. Such matters as the conservation of the water supply at the sources of rivers; the clothing of barren wastes; the supply of lumber, wood for paper pulp, railroad ties, etc., are matters that interests everybody, because the business interests of all classes are so interwoven that what advances one or retards another affects in a short time the whole community. It is not within the scope of this paper to discuss general problems of forestry, but it may not be out of place to mention in passing that the farmer of today is doing most of the conserving of moisture that is done, and probably on many up-to-date farms there is less of storm water running off than when the same land was in forest.

Short rotation of crops and deep level culture is absorbing most of the water, as it falls and at the same time using it for productive purposes, while the roofs of stores and factories and the hard streets of cities start the water at once through storm sewers on its journey to the ocean.

When we come to the forestry problems that personally interest the farmer we find that they are much less numerous than formerly and growing less so every day. In this age of steel and concrete the use of wood is being eliminated in some way every hour. Even to the farmer with a genius for construction and a workshop equipped with tools there is very much less opportunity for the use of wood than formerly. A very simple illustration shows the present condition of matters as regards the need of wood in the old-time way. A teamster needed two sled stakes. He jammed the two parts of a broken whiffletree into two pieces of iron pipe, trimmed the protruding ends a little and he was provided with as serviceable stakes or levers as if he had chopped two twelve-year saplings for the same use.

Formerly the fencing problem was a large one, but it has been reduced to quite moderate dimensions and is not at all serious as a tax upon many farms. This is because the farmer has learned the wisdom of a permanent pasture, which dispenses with seven-tenths or more of all fences, and at the same time does away with the expense of keeping clean a lot of waste land which the fences take up. Even the compulsory fencing laws which the fence-wire trust has worked through the Legislatures of many states have not materially altered the situation, because the farming communities are so intimately connected by telephone, rural mail routes and Grange membership that they cannot afford to take advantage of a doubtful legal right at the expense of possible and far-reaching discord.

Let us look for a minute at some of the phases of the building supply. I do not have to think back a great many years to the time when a neighbor had to renew his barn sills. He hunted up a gray-haired man skilled in the use of the broad-axe, got together half a dozen men with axes, cut some straight, handsome oak trees—each more than a hundred years old—and with much labor fashioned the sills, and with still more labor, and much lengthening of the wagon reach, drew them to the barnyard, where the old carpenter spent much time in putting them in place. A few weeks ago another farmer replaced a sill. He brought home in his carriage two bags of cement. His hired man went to a gravel pit on a drizzly morning, and when he returned the rotten sill was removed from the foundation and two boards set up to form a trough. Into this trough a mixture of sand and water, of no commercial value, and the cement was poured. It was punched energetically with the end of the shovel handle, and kindly smoothed with the blade, and left a day or more. Then the boards were laid upon the mass of stone, toe-nailed to the posts and the siding nailed to the edges of the boards. There was no lifting, no awkward teaming, no carpenter's bills and no waiting for a hundred years to grow wood for a new sill. Some day the sides of that barn will need renewal. Then the hired man will make several trips to the gravel pit, and a few bags of cement will be purchased. Some plank from the floor will be placed upon the stone sill, and in a few days, with unskilled labor entirely, that barn will have new sides of indestructible rock. There will be no lumber bills, no carpenters' bills, no occasional paintings. Revolutionary changes of this character are so common nowadays, and invention is so persistent in furnishing substitutes for wood that one must have a very sanguine disposition to go into forestry for his children's good, especially when he can feed those children in July upon early cabbage planted in March, and on early peas planted in April, either crop of which, under favorable circumstances, will yield a clear profit of $100 per acre. This may seem like a very pessimistic view of the situation from one who might be expected to be an optimist in forestry matters, but it must be remembered we are looking at it from the farmer's standpoint. As a class they are not in business to develop a fad, or make lengthy and costly experiments. The better class of farm land is much too valuable to devote to crops which require many years to produce profitable returns. There can be no doubt that the growing of forests is a speculative venture, made much more uncertain because to reach remunerative results it must have the coöperation of two generations. It is not at all unusual to see a man devote years to saving a thrifty growth of young timber and have the next generation or owner sacrifice it and raise oats and corn, both of which bring cash returns within the year.

On account of these facts I do not look for very much forestry enthusiasm from the farmers as a class. The things they can use even small growths for, are not numerous or costly. A farmer's expense for whiffletrees, doubletrees, mattock and other handles—little things which he can make himself—is not very large, and this is greatly discounted by the labor of making, and the clumsiness of the home-made article as compared with the machine work. Even bean poles, the very rawest and most quickly available product of the young or infant forest, are no longer profitable to use. It is less expensive to set posts and use chicken netting than to bother with procuring, sharpening and setting poles, and the labor of taking up and housing the poles is another item of expense.

The only real pressing need which the farmer has for a timber-lot is for fence posts and fuel, and in many sections the cost of preparing fuel from standing timber is nearly as great, when the labor is hired, as the cost of coal. This has been the case for many years in my own township, which has had local coal beds and cheap coal.

With all the reasons I have enumerated for not growing timber, a timber supply often is convenient, and I should hate to see any farmer tie himself down to the cold profit and loss view of the case and not be willing to add something to the beauty of the landscape. There is an old saying that he can do a little who cannot do much, and this is eminently true in starting a little plantation of trees. Some forty years ago my father plowed out three locust trees about the size of a broom handle. I always had a passion for planting trees and shrubbery, and after the trees had laid for some days partly uprooted, I took a spade and carried them to the edge of the woods, two hundred rods away, and planted them. They flourished, and had not the ground been plowed I have no doubt that the sprouts would have crossed a twenty-acre field and set it thickly to a locust forest.

If one wants a constantly increasing plantation of trees, all that is necessary is to set a row of yellow locust, mazzard cherry, sassafras or quaking poplar, and let it spread in either direction. Method can be given to the plantation by plowing a deep furrow about eight feet farther out every year. This will cut the roots and cause the sprouts to come up in rows. The yellow locust I consider the most profitable tree of all for posts, as it is a rapid grower and blue grass will thrive under it, making it possible to plant a pasture and still not lose the use of the ground. For a hard-wood timber tree in Ohio for whiffletrees and various kinds of handles, the white ash is far ahead of anything else.

For fuel, there are several trees which thrive in northern Ohio and are easily grown. Probably the most rapid grower is the silver maple. The wild black cherry is a rapid grower, and also the mazzard cherry, and both make excellent fuel. The chestnut is probably the best all around general purpose tree except for uses to which the hickory and white ash are applied. The white willow is a very rapid grower, and if it will make paper pulp, I should think it could be grown profitably, as farmers in Vermont are getting at the present time $5.75 per cord, according to a recent issue of the Country Gentleman. In conclusion to this somewhat rambling paper, let me suggest that there is another view of the timber planting question, and that is educational. If a young man or young woman can become interested in tree planting and tree growth, they have taken a long step in the direction of acquiring a liberal education. As a rule the farmer's education is wholly lacking in botany and all that pertains to tree growth. The matter receives almost no attention in the Grange and at Farmers' Institutes, and if the Forestry agitation does nothing more than awaken a portion of the farming population to an intelligent appreciation of plant life, it will have accomplished much toward lifting the rural population to a higher plane of thought, and added no inconsiderable sum to the pleasure of living.

DISTRIBUTION OF FOREST TREES.

BY C. A. MINER.

In order to understand the relations and distribution of our trees, one should have in his mind an outline, at least, of what our American forests are like, and also of how they came to be what they are. Each of the three main divisions into which the forests of North America so naturally divide, has certain peculiarities which distinguish it from the others.

Let us first consider the great Atlantic region: This immense territory, not many decades since, was almost uninterruptedly covered with forest. For thousands of square miles in many portions of it there was not enough open space in which to establish a farm. The few clearings made by the Indians were hardly worth considering. Thus the interminable woods extended from the Atlantic coast across the Appalachian Mountain chain, leaving bare but a few lofty peaks, and on into the great plain of the Mississippi Valley country. In the north the "heavy timber," as it is called, is bounded quite abruptly by the treeless expanses of the Great Plains. But farther to the south there was a large region where forest and prairie struggled for the mastery. The result was, generally speaking, that the prairies covered the undulating uplands; sedge marshes the wet, broad depressions, and forests the river valleys and the few hilly places.

The species constituting this great area of primeval forest were far from being the same in all parts of the territory. Far to the north, on the bleak shores of Hudson Bay, scarcely any trees except spruce and balsam poplar were found. As you went south you meet the little jack pine and trembling aspen. Next you entered the domain of the stately white pine, the red pine, and the dignified, slow-growing hemlock. By this time you are fairly within the realm of the broad-leaved trees, such as the oaks, maples, beeches, chestnuts, sycamores and many others. As you go south the number of species increase until in the latitude of Kentucky, southern Illinois and North Carolina, the eastern forest reaches its greatest development so far as diversity of trees is concerned. Further south the conifers, especially the pines, again become more prominent, as they were toward the border of British America. The extreme southern portion of this division takes on a different character, many varieties properly belonging with the typical West Indian species. The most distinguishing feature of the whole region, however, except the arctic edge, is the prevalence of broad-leaved trees. Over wide areas not an evergreen tree can be seen, unless it be the arbor vitæ or tamarack of the swamp. Elsewhere broad-leaved and coniferous trees grow mingled together with broad-leaved ones holding the decided majority; while there are yet other areas of considerable proportions where the pines and their congeners exclude the broad-leaved rivals altogether.

However, in the other two forest zones—the Rocky Mountain and the Pacific—the coniferous or evergreen trees have almost a monopoly. To be sure there are broad-leaved trees in these sections, such as oaks, maples, poplars, etc., but they form little, scattered groves here and there, or crouch in the ravines of mountain streams, without impressing themselves upon the character of the landscape. The trees, contrary to those of the eastern belt, whose branches intermingle, stand far apart, so that often their crowns are widely separated. This condition is probably due in a measure to an insufficient supply of moisture. Another feature distinguishing the forests of the Rocky Mountain region from those of the Atlantic side, is that nowhere do they cover such immense areas in unbroken compactness. They are distributed along the mountain ranges in belts, leaving bare the highest portions and rarely occupying the broader valleys and plains. Not only have the pines and other conifers the overwhelming majority of numbers in these western forests, but they display a far greater variety of species, compared with eastern woods. Some of the western species, like the white and bull pines, spread over large areas; while others, like the Monterey pine and the redwood, are restricted to a few valleys or mountain ranges. Of the 109 coniferous species native to the United States and enumerated in Sudworth's list, 80 belong to the country west of the Great Plains, 28 to the eastern forests, while only one, the common juniper, inhabits portions of both regions.

What has been said of the particularly open character of much of the western forests, does not apply to those portions found in the western halves of Washington and Oregon, and thence stretching along the coast into Alaska and far toward the arctic regions. On the contrary, these are among the densest woods in the whole world. Here are found, excepting only the sequeoia of California, the most gigantic trees on earth, and eternal twilight covers the ground. This region is subjected to an unusually great rainfall.

The distribution of trees is due not alone to the topographical and climatic conditions, based upon the difference of soil, elevation, temperature, humidity, etc., but also upon the historical factor arising out of the order in which the seeds of different species were deposited in each particular locality, or failed to be so deposited.

The paleobotanists, drawing their conclusions from the remnants of wood, impressions of leaves, flowers and fruit, and other small relics of extinct vegetation which are found imbedded in rocks and beds of coal or peat, have established the fact that during tertiary times vast forests, composed of trees not very different from those now growing in the United States, existed in the far northern regions nearly up to the pole. The succeeding glacial period, however, covering the territory as far south as Cincinnati, caused the destruction of all included forests and the species composing them were either extinguished or restricted to more southern latitudes. But after thousands of years the climate gradually became milder, the edge of the continental ice-sheet slowly melted, forming immense rivers and lakes. As the land was laid bare, vegetation recovered the lost territory step by step. Spruces and poplars came up from the south and are probably continuing their march to this day. These most arctic of American species were followed by the pines, and these again by the more southern species of hard-woods, maples, oaks, beeches, and the like. While thus the forest as a whole was advancing northward, the various species fought among themselves for each locality. The fight continues to the present day, and is changing the distribution of species from century to century. It is very probable, for instance, that both north and south the hard-woods are gaining ground at the expense of the pines and spruces. The hemlock does not reproduce itself in a portion of Wisconsin, and consequently will die out there, unless man interferes, when the present generation of trees has run its course. The red and black oaks are gradually supplanting the white oaks in many parts of the country. Trees have no claws or teeth with which they can attack each other as animals do, but they fight, nevertheless, and the numbers of the dead and wounded in these battles are tremendous. Competition is Nature's law in regard to the distribution of trees, just as each species competes with every other species for the most favorable places, so every individual tree competes with every other, whether of its own or a different species.

THE PRESERVATION OF THE WOODLANDS YET LEFT IN THE STATE.

H. WARREN PHELPS.

To renew the neglected woodlands means the return of the conditions that formerly existed in them. By our usual system of management all the secondary growth so necessary for protection of the physical condition of the soil, moisture and plant food, and the forest trees themselves has been removed. The only woodlands that now seem to be in a flourishing condition are those that are so inaccessible as to make it impossible to use them for secondary purposes. The demand for more land for the raising of grain, hay and pasture has caused the draining of the level lands, and the disappearance of ponds and swamps, formerly a constant source of moisture to woodlands on the surrounding lands. Many fine trees, growing near these ponds, very rapidly decayed upon the drainage of the land, and when cut showed the presence of a dry rot that seriously lessened their value for lumber purposes. Other trees, growing where they were bountifully supplied with moisture, made lumber perfect in strength and grain.

Close pasturing with live stock is another cause for the decay of standing trees. A covering of undergrowth of grass, shrubs, etc., is necessary for the protection of the soil and its supply of moisture. This covering the grazing animals destroy, and the trees begin to die.

When intensive, rather than extensive, cultivation of farm lands becomes more common, farmers will find out that they do not need all their acres for the growing of farm crops. A few acres will be found that can be devoted to the growing of timber to better advantage. The tile draining the ponds may be taken up and the area will again be covered with water. Restore the natural conditions to the soil and Nature will usually quickly cover it with a covering of timber that will be of inestimable value to future generations. Many fine walnuts, hickories and maples have been cut down and sold for a few dollars, when, if they had been left standing upon the land, the annual income from nuts and syrup would have far exceeded the value of the grain raised upon the same land.

The question of fencing material is already a serious one for farm owners, and will probably become more so. The present supply must be husbanded and new growth started to meet this necessary and constant demand. Every farm owner should coöperate with the State Forestry Society in its effort to save the woodlands of the State from destruction, and encourage the planting of new tracts for the use of future generations.

THE COLUMBUS HORTICULTURAL SOCIETY.

HISTORICAL STATEMENT.

WILLIAM R. LAZENBY.

On April 1, 1845, sixty years ago last April, a call was issued for a public meeting of those interested in horticulture in the city of Columbus and immediate vicinity. In response to this call a meeting was held April 10th, and it was then and there decided to organize a horticultural society. At this time Columbus was little more than a prosperous village, and it was not until 1870, twenty-five years later, that she had attained a population of 30,000. In 1880 she had reached 52,000; in 1890, 88,000; in 1900, 125,00, and in 1905, a safe estimate is 150,000. In other words, Columbus now has at least ten times the population that she had when the Columbus Horticultural Society was first organized.

On May 12th, 1845, the second meeting was held, a constitution and by-laws adopted, officers elected and the society started upon its career amid a good degree of enthusiasm. Bela Latham was the first president; William S. Sullivant and Samuel Medary, vice-president; Joseph Sullivant and M. B. Bateham, secretaries, and John Burr, Alexander E. Glenn, Joel Buttles, John W. Andrews and one or two others made up the executive committee.

On the 26th of September, 1845, the first public exhibition of the Society was held, at which there was a fine display of fruits and flowers, and which was well attended.

At this time there was no other horticultural society east of the Allegheny Mountains, and to the best of my knowledge there were only four horticultural societies in the Western Continent. The societies in existence were the state organizations of Massachusetts, Maine, New York and Pennsylvania. There were no national organizations at that time. It might appear from what has been said that nearly all we have of horticulture to-day has developed within the last sixty years, but such is not the case.

Prior to the year 1845 we find here and there a man intensely interested in garden and orchard, full of enthusiasm for this, the first of human arts.

It was then that A. J. Downing first gave to the world that great horticultural work, "Fruits and Fruit Trees of America," and C. M. Hovey was publishing the "Magazine of Horticulture" in Boston. Others active and prominent in the work were Marshall P. Wilder, Patrick Barry, Robert J. Manning, Charles Downing, William R. Prince and the Parsons. Besides those already mentioned in connection with the organization of the Columbus Horticultural Society, our own State had its Longworth and Warder of Cincinnati; Kirtland and Elliott, of Cleveland; and Campbell, of Delaware.

The Columbus Horticultural Society was incorporateed by a special act of the State Legislature, passed March 13th, 1849, which was unanimously accepted by the Society May 26 of the same year. Under the act the constitution and membership then existing were continued.

The prevalence of cholera in Columbus during the years 1849 and 1850 prevented the Society from doing much more than to keep up its organization. From 1851 to the beginning of the Civil War, ten years later, the Society was in a flourishing condition, and was a pronounced factor in the life of the city. But owing to the disturbed condition of all public affairs at the outbreak of the Rebellion of '61, it was decided to suspend meeting for a period. This suspension continued during the term of the war and for a number of years thereafter.

During the year 1851 the Society decided to purchase some land for the establishment of an experimental or trial garden. After carefully examining different sites it was decided to purchase ten acres near Alum Creek, owned by Samuel Barr. This ten acres cost the munificent sum of two hundred dollars, but the time was not ripe for parks and gardens, and the land was finally sold and soon thereafter became a part of the property of the Franklin County Agricultural Society, now Franklin Park. From the sale of this property the Society realized the sum of three thousand dollars, which has since been held as a perpetual fund. In 1878 a resolution was passed constituting all members of twenty years' standing who were not in default for their dues, life members. These numbered sixteen. In 1893, eight of the sixteen still survived. In 1879 the Hon. Henry C. Noble, who had been president for many years, declined a re-election, and Professor N. S. Townshend was elected in his place. In 1882 Col. G. S. Innis was president, and he was followed by J. M. Westwater, who served the Society faithfully for several years, and was succeeded by the following, each of whom served for two or more years: O. W. Aldrich, Horace Wilson, John J. Janney. In 1895, William R. Lazenby was chosen president, and has been re-elected every year since that date.

Mr. Janney was the faithful secretary of the Society for many years prior to 1885. Since then the office has been held by various graduates of the Ohio State University, all of whom have achieved distinction in their professional and scientific work. The office of president has been held by the present incumbent for the past ten years, and the Society has had a permanent home in the Horticultural Department of the Ohio State University since 1890.

Owing to the careful management on the part of W. G. Deshler, who was for many years the treasurer of the Society, and others who succeeded him, the endowment fund was increased to six thousand dollars, and this, by judicious investment, yields a comfortable income.

The history of the Society from the year 1886 can be found in the volumes of the Journal, which was issued monthly until 1890; since then until the present year, as a quarterly.

For sixty years this Society has diffused its beneficial teachings throughout this community, and has made itself felt in fields far distant. Its work has been done quietly and persistently. It has tried to improve its opportunities, meet its obligations, and do its duty. It has cheered many an anxious worker and brightened many a home. Its spirit and motive have always appealed to the higher rather than the lower qualities of our nature. It is one of the organizations of which Columbus may well feel proud, and which she may wisely cherish.

INFLUENCE AND BENEFITS OF HORTICULTURAL SOCIETIES.

W. W. FARNSWORTH.

The influence of any society is in accordance with the aims and object of such society, and the extent of such influence depends upon the attractiveness of these aims to the public, and upon the vigor with which they are pressed upon its consideration.

The constitution of the Ohio State Horticultural Society states that its object shall be to collect and disseminate information relative to fruits and other horticultural products, and to promote the taste for horticulture and rural embellishments among the people.

The objects of local and county societies are practically the same.

One important feature which naturally follows, although not expressed in the aforesaid constitution, is the rare social pleasures enjoyed in the meeting together of persons engaged in the interesting and ennobling occupation of providing for themselves, their families and the public an adequate supply of fruits and flowers—the *luxurious necessities* of life—if you will allow the phrase, and of beautifying their surroundings by means of the judicious use of grass and plant and tree and shrub, those accessories with which Nature loves to deck herself for holiday attire.

A single individual laboring to bring to the public a realizing sense of the beauties and charms of horticulture, can accomplish much, but when a company of such persons are joined together in helpful coöperation, they aid each other by their counsels, and inspire by their enthusiasm.

The forces which mold the character of the public and direct its actions, work so silently and unobtrusively that it is difficult to determine definitely just how far certain causes have been instrumental in producing certain desired results.

We do know positively, however, that the efforts of these societies are decidedly beneficial to the public at large and injure none.

Horticulture seeks to make the world brighter and better and its followers healthier, happier and better citizens.

Horticultural societies seek to aid their members in accomplishing these results and to bring these advantages as far as possible within the reach of every citizen.

One among the many instances which might be cited as showing this beneficent influence may be found in Dayton, Ohio:

Some forty years ago a little band of horticulturists of that city met and formed the Montgomery County Horticultural Society. Their labors soon came to be appreciated, and their efforts toward beautifying their city have resulted in its receiving the proud and merited title of "Gem City."

But their influence did not stop there.

An enterprising young firm of manufacturers were impressed by the object lessons placed before them, and recognized not only the esthetic, but the commercial value of beautiful and refined surroundings.

The National Cash Register Company was situated in an undesirable part of the city, and the class of help to be secured therein was not satisfactory.

They began improving the people by improving their surroundings, by methods with which most of us are already familiar, and the results are so marked as to furnish an example and a model which has been studied with profit far beyond the limits of our own land.

Thus the work of our revered Ohmer and his fellow workers has exerted a wider and more beneficial influence than they could have hoped for in their fondest dreams.

The horticultural society is unlike a society of most professions in that it has no trade secrets and no star sessions.

If one of our members discover a new method of combating a fungous or insect pest, or learn anything which will aid in our profession, does he jealously guard the secret by copyright and caveat or patent, thus outstripping his competitor and reaping a profit? Instead he spreads the news of his discovery far and wide, that all may be benefited thereby, and even asks the State for an appropriation to print his discoveries for the benefit of the public.

Those who would succeed in this work must keep close to Nature, study her means and methods, and learn her secrets, and this close communion with these mighty forces must needs exert an ennobling and refining influence upon all who are made to feel it, and in sharing her bounteous gifts we are unconsciously made more generous to our fellowmen.

The highest achievement of the landscape artist consists in recognizing, appreciating and reproducing the most beautiful effect of Nature's handiwork.

Any force which promotes a freer and more general use of our homes and surroundings is a force which tends to make a stronger and better nation.

No stronger proof of this need be cited than the wonderful progress which the "Flowery Nation" of the Far East is making in the pursuits of peace and of war.

The free use of horticultural products tends to a healthier body and a clearer brain; hence, greater capacity for effective labor and for wholesome enjoyment.

Let us then go forward enthusiastically with the good work. And who can be enthusiastic in his work if not the horticulturalist?

Surrounded by the beauties and privilges of Nature, and working in partnership with her, with our children growing to manhood and womanhood among fruits and flowers and trees and shrubs, enjoying their company and assistance as is possible in but few vocations, and knowing that our success not only brings prosperity to ourselves but increased comfort and luxury to our fellowmen, let us rejoice in our lot and assist others to share in these blessings.

SOME INSECT Enemies ~~REMEDIES~~ OF GREEN-HOUSE PLANTS WITH NOTES ON REMEDIES.

IRA J. CONDIT.

According to the census of 1900, Ohio ranks sixth in the amount of glass surface in florists' establishments. Five hundred and five green-houses were reported, with a total glass surface of 5,214,275 square feet. Reducing this to acres we have 1,077 acres of ground under glass in Ohio devoted to the raising of flowers and plants. The total value of the products of the green-houses in Ohio in 1899 was $1,399,957. These figures give us some idea of the importance and extent of this industry in Ohio.

In order to obtain practical information from practical men, the author sent out over five hundred circular letters to green-house men of the State asking the following questions:

1. In your experience which has given you the most trouble, insect enemies or fungous diseases?
2. What insects have given you the most trouble?
3. Which do you regard as the greatest pest, green fly, brown scale, mealy bug or red spider?
4. Upon what crops or plants are the above insects the most injurious?
5. What remedies or insecticides do you use?
6. Do you fumigate with tobacco? If so, how often? What insects will tobacco smoke have no effect upon?
7. Have you ever used hydrocyanic acid gas, carbon bisulphide or other like remedies?
8. Are you troubled with insects which work at the roots of your plants?

Although the questions could be somewhat improved and the results were not quite as satisfactory as might have been, we have received much valuable and interesting information, especially on the use of hydrocyanic acid gas in fumigating greenhouse plants. Of the replies received, fifty stated clearly that insect enemies were more troublesome than fungous diseases; three said that the honors were about equally divided; the rest were undecided as to which was the worst. The four insects which the florists regarded as being most troublesome were: First, green fly; second, red spider; and third, thrips. The scale insects were most common on the citrus plants, palms, ferns, oleander, etc. Mealy bugs are found almost universally on coleus plants and bedding stock. Nearly every florist fumigates with tobacco smoke from one to three times every week; although tobacco smoke is generally fatal to green fly, it is not effective in controlling red spider, mealy bug, scale insects, thrips, white fly or wood lice.

Only a few florists have used hydrocyanic acid gas in their green-houses; some consider it too expensive; others thought it was too dangerous. A few who have used it carefully and judiciously, have found it greatly superior and much cheaper than many other remedies. Although we can treat of only a few of the many pests which are so common in green-houses, we have described those which are the most generally distributed, and given some of the most successful remedies in each case.

The sow bugs generally feed on decaying vegetable and animal matter, but they also attack living plants and are fond of the fibrous roots of orchids, lettuce, carnations, etc. Sliced potatoes, poisoned with paris green, is the best remedy for the bugs. An extensive lettuce grower in Michigan had his crop damaged about $400 by sow bugs before he tried the poison. The result was a complete success, and in two nights in which he used the potato slices, he estimated that he had destroyed about twenty-four thousand specimens.

The red spider, although not an insect, is a very troublesome pest. It is so small as to be scarcely discernible to the naked eye, and often does considerable damage before the florist finds out the cause of the trouble. If the spider is left to develop unchecked, great damage is sure to be done; and in fact it is questionable if a plant once badly infested with red spider can ever be restored to the normal state. Syringing the plant with water is the simplest and most effective remedy for the spider. Soap, sulphur and fir-tree oil are also good remedies.

Plant lice, the common green fly of the green-house, although not so difficult to control, are always present, and must be continually fought. Their abundance is not due so much to the prolifigacy of the female, but with the rapidity with which the young begin to reproduce. Tobacco fumigation is the almost universal remedy for green fly.

The white fly (*Aleyrodes vaporariorum*), often becomes abundant on such plants as salvia, ageratum, coleus, cucumber, tomato, etc., when grown under glass.

The white fly was found very anbudant in one green-house which the author visited; when the foliage was brushed back with the hand the disturbed adults would fly up in clouds, but would soon settle back upon the leaves, sash-bars or any place they happened to strike. Fumigation with hydrocyanic acid gas is the most successful remedy where it can be used. Ivory soap and water (1 lb. to 8 gal. of water) is the most efficient of the sprays.

Of all the insects which are commonly found in the greenhouses, the scale insects are probably the most perplexing. They are found commonly on palms, ferns, oleanders and hard-stemmed plants, and multiply so rapidly that their presence in a conservatory is generally considered as a matter of course. Four species of the armored scales are found quite abundant in most green-houses; three species of the naked scales or *Lecaniums,* are quite common on palms and other ornamental plants. Scale insects are as a rule exceedingly difficult to destroy on account of their scaly covering, which protects them from insecticides as they are used for other insects. The florists from whom the author has received information recommend the use of Whale-oil soap, kerosene emulsion, fir-tree oil, ivory soap and nicotine wash.

The scales are first loosened by the use of a stiff brush, and the wash is then applied to the foliage of the plants.

The mealy bug and orthezia are both found on tender plants, such as coleus, and various bedding plants. The mealy, waxy coat with which these insects are covered, protects them to quite an extent from the sprays and washes ordinarily used. An ounce of prevention is worth several pounds of cure in this case at least; inspect and clean all plants before they are brought into the green-house. Kerosene emulsion, alcohol and ether, oil and soap washes are all simple and efficient remedies.

The thrips is a minute insect, which attacks carnation and rose blooms in the green-house, and is a very troublesome insect at times. It is an exceedingly abundant insect out of doors, and can be found on almost every blossom of clover, daisy, apple, rose, etc., which opens in the summer time. Any spray, in order to be beneficial in destroying the thrips, must come in contact with the body of the insect. Kerosene emulsion and fir-tree oil give good results if the applications are thorough and are made as often as the insects appear.

The florist is often bothered with cut worms in much the same way as the gardener out of doors. The remedy is practically the same: Poisoned clover or bran placed among the plants will be almost sure to destroy the cut worms in a short time. Wire worms and white grubs often become troublesome in the green-house; they do their work beneath the surface, and are not so easy to destroy. Lime water is the most widely recommended remedy for insects which work at the roots of plants. Probably the surest way to guard against such pests is to thoroughly steam or bake the soil before bringing into the green-house; carbon bisulphide is a practical remedy, and one which should be most commonly employed.

Ants are often much too common in the green-house for the welfare of the plants. It is questionable sometimes whether to regard them as friends or foes. They often push their galleries in among the roots of plants, build their nests in the soil, and are then more harmful than beneficial. The colony can easily be controlled if we can find the nest; a little carbon bisulphide poured in and around the nest will soon put an end to their existence, and kerosene used in small amounts will destroy the nest and drive the occupants away.

"Florists must abandon the idea that their duties consist in mixing villainous compounds for plant ailments and making their green-houses hospitals for diseased ones or sanitariums for their recovery. The prophylactic method is the best method of growing most plants and of keeping them free from disease." Keeping plants healthy and thrifty is the best safeguard against insects or fungous diseases. But with all our watchfulness and care, the time will come when we are compelled to apply remedies in some form or other, so we will give a few of the best remedies and tell how to prepare and use them.

Tobacco in its various forms is probably used more extensively in the green-houses than any other insecticide. The use of tobacco vapor has largely superseded fumigation with smoke. The vapor is formed either by passing steam through a solution of tobacco or by placing the solution on the heating pipes. The vapor is considered superior and more effective in getting rid of the aphis.

The use of hdrocyanic acid gas is the green-house is still in its infancy, and we cannot recommend it for general use except with the greatest caution. We believe, however, that where it is used carefully and judiciously it is the cheapest and most effective remedy the florist can use. One florist who has used the gas successfully. says: "I will use it more now as it is not expensive. I really believe it is cheaper than anything I ever used which did the work perfectly." Another writes: "I have tried other remedies, but have found nothing to equal it. All insects which the gas reached were killed, such as green and black fly." For general green-house fumigation, one ounce of cyanide per 1,000 cubic feet of space seems to give the best results. Dr. Albert F. Woods, of the United States Department of Agriculture, says: "I fumigate my green-house and cold frames about four or five times a year with it, and have thus far been able to keep down all insects and animal pests except the red spider. However, about 80 per cent. of the red spiders are killed by the regular treatment recommended; but to completely control the red spider it is necessary to use water under pressure."

The use of carbon bisulphide in the green-house is necessarily limited. Its great use is to exterminate insects which work on the roots of plants, and for this purpose it is very effective. It can also be used quite successfully in sterilizing the soil before it is brought into the green-house. All that is needed in this case is a large tin box in which the soil can be placed and the vapor confined.

Few florists recognize the value of the service rendered by the presence of a few toads in the green-house. Their capacity is almost indefinite, and is limited only by the number of insects they can obtain. It has been estimated from careful observation that in twenty-four hours the toad consumes a quantity of insect food equal to about its stomach capacity, where such food is available. In other words, the toad's stomach is practically filled and empties four times in each twenty-four hours. Its value as an insect eater is more generally recognized in England and France than in this country; in fact, the demand for toads by English gardeners exceed the home supply, and dealers have begun to look to the United States for an additional stock, often paying as high as $25 per hundred for colonizing purposes.

ORCHARD COVER CROPS.

N. E. SHAW.

The practice of using cover crops in orchard management has but recently come into general usage. Formerly where orchards were kept in grass or allowed to grow up in weeds, there was no occasion for the use of soil covering. But with the more recent method of cultivating the orchard, there came the necessity of some covering to protect it and the soil from the many harmful influences which act upon them during the dormant period.

The time for starting the crops will depend on the location. But it should always be sown early enough to allow it to make a growth before checked by frost. After the crop has made a start, it begins taking moisture from the soil, thus robbing the trees of their supply, hastening it on towards maturity and making it ready to withstand the cold of winter.

As the crop grows, its roots penetrate deeper and more thoroughly through the soil, thereby improving its physical conditin by preventing soil particles from running together and puddling or cementing, which is common to many clay soils.

With the coming of fall rains and winter snows, the covering shows one of its most useful properties. Instead of these rains being lost by running off of the surface, and also carrying away large quantities of soil, they are allowed to gradually sink into the soil, thus storing up a supply of moisture for future use. The soluble salts in the soil are also prevented from leaching away. They are taken up by the roots of the plant, stored in its tissues and saved for the use of the trees when the crop is plowed under the following spring.

With the use of an effective covering to the soil, the danger of frost and freezing is in a large measure prevented. By actual experiment a more even and higher temperature has been found to exist upon soils where a cover was used than where the soil was left bare. A cover is quite beneficial in this respect by keeping the ground frozen somewhat longer in the spring, thereby retarding the blooming a few days and often preventing injury from late frosts. When the time for cultivation comes the crop is turned under and a large amount of humus is added to the soil. The water-holding property of the soil is again increased, and at the same time rendering it loose and friable and easy to cultivate. As decay sets in plant food is quickly made available. Earth-worms find conditions favorable for their work in the abundance of organic matter, and by their useful agency the soil is better aerated, finer particles are brought to the top and their solubility increased. Carbonic acid is formed, which produces beneficial changes, attacking and disintegrating stones, dissolving lime and phosphorus, bringing together and making more plant food.

In selecting a clover crop, certain facts should be considered. The needs of the land and its ability to produce the crops are of primary importance. If the soil lacks nitrogen, one of the leguminous crops should be sown, for in this way large quantities of that element are added both by taking up the leaching nitrates and by the assimilation of the free nitrogen from the air.

The characteristics of the crop to be considered are as follows: The seed should be comparatively cheap, and have the power to germinate quickly where sown broadcast. It should be a free grower, and also free from those qualities which would cause the crop to become a troublesome weed. The root system should penetrate deeply and vigorously, and in this way gather food which would otherwise be beyond reach. Ability to withstand frosts and to grow at a low temperature is also desirable. As their period of growth is limited, it is therefore necessary to make as good growth as possible in the time allowed.

Cover crops are of two types: First, the leguminous ones, which, by means of the action of bacteria on their roots are able to take up free nitrogen from the air and convert it into plant food. Second, the non-leguminous ones, which do not have that quality. Of the first type, the more important ones are crimson clover, vetch, cow peas, field peas and soy beans. Crimson clover is one of the best where it will catch well. It reaches a height of from six to eight inches, forms a large root system, and grows until cold weather. Its enormous root growth is of great benefit, and its thick coating of stems and leaves make an excellent green manure. Hairy vetch is a close rival, and has an advantage over the clover in making a better stand. It is also more hardy and starts to grow early in the spring. Cow peas and soy beans are of lesser importance as they are killed by the first frosts, lose their leaves and do not afford much protection.

Among the non-leguminous crops, oats, buckwheat, rye, corn, rape and turnips are the more important ones. Of these, oats is perhaps the best. It is easily sown broadcast, and the seed is cheap. It grows until the ground is frozen, makes a dense growth, which stands up well and is valuable in holding snow. In an experiment with seven other crops side by side, the plat containing oats was covered with three inches of snow after it had entirely disappeared from the other plats. Buckwheat has many of the advantages of oats, but is killed by the first frost.

In general, the non-leguminous crops are not of as much importance as the leguminous ones, especially in gathering nitrogen. While they do not retain a large amount, they add an abundance of humus and largely improve the mechanical conditions of the soil. They are easier and cheaper to grow, and where nitrogen is not greatly required, they are often the best to use.

FALL MEETING.

The fall meeting of the Society was held at the home of Mr. F. P. Vergon, of Delaware, the afternoon of October 14th. No business was transacted, and no set program was attempted. The greater part of the afternoon was passed in inspecting Mr. Vergon's apple orchard, which has become famous all over the country for its wonderful production of annual crops of apples. Mr. Vergon explained his methods of management fully, and in every way proved himself a delightful host. Mr. L. K. Sutton presented a short paper on "The Commercial Outlook For Apples." After extending to Mr. Vergon a unanimous vote of thanks for his kind hospitality, the Society adjourned.

COMMERCIAL OUTLOOK FOR APPLES.

L. K. SUTTON.

Never in the history of our apple industry have the prospects been more promising for the planting of commercial orchards than at the present time, not because there is a comparatively light crop this season and some orchards have been sold at fabulous prices, but rather on account of the consumptive demand for American apples in all the markets of the world. Our apples command a premium everywhere over all others, and we have never had too many good apples. Some years when the crop is large, prices will rule low, but with a full crop and fairly good prices, apples pay as well or better than any other crop the farmer can grow.

What is needed most is a compulsatory spraying law. If in force, the insects would soon be destroyed, and it is wicked for any farmer to let his orchard grow up in weeds, and thicket patches to flourish simply because his crop fails one or even two years. Cultivate and prune every year, whether there is a crop or not, and when a crop does come, you will have apples enough to pay for the cost of all labor expended.

At the last meeting of the International Apple Shippers' Association the following resolution was adopted: "Resolved, That the chair appoint a committee of seven to draft resolutions requesting Congress to pass suitable laws to regulate the sale of cider vinegar, so that all vinegar sold as cider vinegar shall be made of pure apple juice." The president also urged that every horticultural society and every one interested in pure food laws, to use their influence in having the request granted. Now, if this law is passed, it will do much to help solve the dropped apple problem, and assist the grower to find a market for the inferior fruit that causes so much trouble to dealers in barreling time.

Our Canadian friends have the advantage, I am sorry to say, over us in the matter of grading and packing of apples. A government inspector examines all the fruit before being marked for export trade or storage purposes, and the apples are marked accordingly. Number One apples must be number one apples indeed ,according to the grade established. A similar law should be in force in the United States, and would save much labor, expense, and be a very great help in the sale of apples.

My advice to one contemplating the planting of a commercial orchard would be to visit many orchards, examining the soil, the fruit; also visit the markets and see what variety sells best nearest your home market; and above all, in buying your trees for planting, go to a reliable nursery, select only the best trees of uniform size, and if necessary, pay a premium for your stock, rather than take culls as a gift, and do not plant your trees too close.

Cold storage facilities are so plentiful now that you are not compelled to sell or put in cellars, as formerly, but you can store and wait for better prices if not satisfied at gathering season.

RENOVATION OF OLD ORCHARDS.

G. T. SNYDER.

The renovation of old orchards cannot be intelligently and successfully accomplished until first ascertaining the cause of the unproductiveness of the orchard. There are several conditions which may be mentioned which are the cause of unproductiveness in the old orchard; such as, diseases (fungus and insect ravages). The trees may need considerable pruning; they may not be varieties adapted to the soil or climate in which they are grown; if the ground is in sod, it may be necessary to plow it and cultivate the orchard; and it may be that the addition of fertilizers in some form is required.

In any case of unproductiveness the grower should endeavor to find the cause of trouble and then direct his energies to the removal of the cause. Orchards which have gotten into the habit of producing small and inferior crops of fruit may be benefited by spraying, thereby killing the parasites which may be living on the trees. But as it is necessary to spray all orchards, old or young, in order to render them profitable, this would not probably be the sole reason for the unproductiveness of old orchards.

Old trees which have been neglected for some years may need rather severe pruning in order to get them into shape for bearing good crops. If much pruning is done in a single season, the result may be the reverse from what was expected, as severe pruning often has a tendency to cause the production of wood rather than fruit. Therefore, pruning should be carefully done in order to secure the desired results.

In case the trees are of varieties which are not adapted to the soil or climate or are varieties which do not readily find a good market, they may be changed to more desirable varieties by top working. A method of grafting highly recommended by S. E. Todd in his book on apple culture, is the following:

All the small branches are trimmed off, excepting a few at the extremities of the larger branches. As a result of this severe pruning a considerable number of suckers will be sent out along the limbs. These are to be removed, with the exception of the larger, more vigorous ones which are situated so that they are desirable for grafting. In two seasons these will usually be large enough for grafting. After they have been grafted the tufts of branches that were left on the ends of larger ones when pruning was first done should be removed close to the grafted branch so that they will not absorb any of the plant food to the detriment of the new parts of the tree. In this way new tops may be put on old trees without the removal of the larger branches.

In grafting or budding in this manner, care should be taken not to let too many young shoots grow, as they are not needed, and grow at the expense of the ones desired. It is a good plan to allow some of them to grow in order to furnish shade for the grafted suckers until they are of sufficient size to furnish shade of their own.

Where several cions are inserted in a stock only the best should be allowed to remain permanently. By this method of procedure new bearing tops may, under ordinarily favorable conditions, be expected in five years. Many old orchards which have long been in sod and have become unprofitable can be thrown into bearing by plowing and subsequent cultivation. Many writers are opposed to this practice, claiming that considerable root pruning must necessarily accompany plowing, and this is not desirable in old orchards. It seems, however, that as root pruning has the effect of throwing trees into bearing that this might be a desirable thing to do. Plowing also has the effect of bringing the soil into a better physical condition and thereby renders more plant food available to the trees. By following the plowing with cultivation and careful tillage the loss of moisture can be prevented and thus more can be obtained by the trees, and consequently more plant food, especially in times of drouth.

The soil in which the trees of old unproductive orchards are growing may have become, through neglect and the production of many crops, so exhausted of its supplies of plant food that it is unable to produce good crops of fruit. In such cases the direct application of fertilizing materials is necessary. Good farm-yard manure is probably one of the best, as it contains,—if it has not been subjected to leaching by rains,—all the essential plant food, and further provides a mulch for retaining moisture. Commercial fertilizers can also be applied to good advantage. As potash is one of the most important plant foods in orchards and is easily leached away, its application and maintenance in the soil should receive especial attention. One of the best and cheapest forms in which to supply potash to orchards, is in the form of ordinary unleached wood ashes which contains 5 to 9 per cent. of this element. Applications of marl and lime are also recommended.

In all cases of renovation of old orchards, trees will be found which should be cut down and removed, as they are obviously beyond help and only serve to occupy space and take up plant food that might better be used by a younger and better tree.

LETTERS AND REMINISCENCES BY OLDER MEMBERS.

MINNEAPOLIS, MINN.

My Dear Professor Lazenby—Your kind note of invitation to the proposed meeting of the Horticultural Society received and and I cannot express to you the loss I experience by my compelled absence from Columbus. I have lived to see. great changes in horticulture. I never knew of an apple or peach being sold until I was thirty years old. The only strawberries I knew were those gathered from the vines in the corners of my grandfather's meadow. If the birds did not get ahead of me I would at least secure enough to realize what the taste of the berries was like. Now they are shipped into the cities by the carload and sold everywhere.

The only roses I had ever seen were two—one the compact "hundred leaf" sort, that all our grandmothers had, and one a single red sort which, I presume, was a wild one from the forest.

Now I see men creating new plants apparently at will and it makes me feel as if I would like to live through the next fifty years in order to see the advances that are sure to be made.

Let me again express my regrets that I cannot meet with you. Yours truly,

JOHN J. JANNEY.

Professor Wm. R. Lazenby:

My Dear Friend—Replying to your kind invitation it would give me great pleasure to be with you at Columbus on the tenth, and if possible will certainly improve this opportunity to be present with you. I cannot tell about the berries but if we should have some extra fine ones at that time I would like very much to send them. I hope the day will be one of great pleasure to all concerned.

Yours truly,

M. CRAWFORD.

Dear Professor Lazenby—Your very welcome letter received. I am very sorry that it did not come to hand in season for me to prepare something of interest to be read at the meeting of the society next Saturday. In order that the letter I am writing you may certainly reach you before the meeting it must be in the postoffice within forty minutes from this time. I can therefore do no more than send greetings and best wishes for the meeting's success with an expression of sincere regret that I cannot add to the success of the gathering, and that I cannot be present.

Dear Professor Lazenby—My knowledge of the Columbus Horticultural Society began in the fall of 1890 when I entered the Ohio State University. The members who attended at that time are now scatterd far and wide. I do not now recall any two who live in the same state except, of course, Ohio. At one of the meetings three men were present whose combined ages made, I think, 245 years. These were Mr. Howe, the historian, Dr. Townshend, and Mr. J. J. Janney. It was that fall that a large number of introduced plants were found about Sellsville. As I recall, the literary program then, was not very different than it is now, except forestry seems to be receiving highly deserved attention. Sub-surface greenhouse bed irrigation came up for discussion and experiment. As one and another member ceased to appear at the meetings some one else new to us would come in, so that the membership in attendance at the meetings did not generally vary widely. The Society is a good example of the work that can be accomplished when there is a well managed endowment upon which to work. Were it not for the funds behind it I fear that with the best of effort by the best of officers the Columbus Horticultural Society would long ago have been a thing of the past. Now there is a constant financial assurance, the lack of which often makes the life of such organizations uncertain if not brief. The Society has in the past been a source of pleasure and profit to not only its membership but to the city whose name it bears, and our hope is that its good work may be extended and more highly appreciated by those whom it endeavors to serve.

Distance and duties deny me the privilege of meeting once more with the members and friends of this Society on its sixtieth anniversary, so I take this opportunity of extending to you individually and collectively my very best wishes and most kind regards.
E. E. BOGUE.

My Dear Professor Lazenby—I am in receipt of your good letter of recent date, and do not know of anything that would give me more pleasure than to be able to accept your invitation to be present on the occasion of June 10. I would take keen pleasure in shaking hands with my old friends of the Columbus Horticultural Society most of whom I have not seen since I resigned the position of secretary, when I came to Cleveland.

I have always considered the Columbus Horticultural Society an organization with far too little public appreciation. Its work is second to no similar organization in the country, and its publications are greatly prized adjuncts to many public libraries. While I was secretary I quite frequently complied with requests from foreign countries that the publications of the Society be sent, and no doubt these requests from abroad still continue, for some of the most authorative of scientific papers have been presented before that Society.

It is with sincere regret that I am forced to be absent from the sixtieth anniversary of this ancient, honorable and useful organization. I wish, however, that you would extend my hearty greetings to all of my old friends who may be present. There are some who will not, cannot, be present, and never will be with you again; but let us all hope, especially we whose years would warrant us thinking that most of our course is yet to run that our lives will be as useful, as beautiful, as theirs.

Yours very truly,
JOHN F. CUNNINGHAM.

Dear Professor Lazenby—Your kind invitation and copy of the program for the horticultural and forestry meeting came duly to hand, and I had hoped that it might be possible for me to meet again with the members of the Columbus Horticultural Society at this time, but the interests of my work here at Washington forbid my being away. I trust that you will extend my greetings and hearty good-will to the members of the society in general, and I also trust that my best wishes for the success of the meetings may be realized in the results attained.

As I visit various parts of the country in the observation and investigation of horticultural problems, the fact becomes more and more apparent that this is a great horticultural country with wonderful resources that largely remain to be developed. Horticultural work, both practical and technical, has only been started, and the next decade will witness a greater growth than has ever been attained. The tendency at present, and this is especially true in the southern states, is to plunge too deeply into one line of work while other lines are neglected. If one planter makes a success of one crop, the following season will witness an over-production in this line and a consequent loss.

Three or four important problems present themselves for solution, prominent among which are increased transportation facilities, better market facilities, diversification of crops, organization of the producers, and improvement and adaptation of varieties. The present transportation facilities have made possible the great horticultural enterprises of the south and the railroads are expending large sums of money in the improvement and increase in their hauling capacity. There is demand for some systematic missionary work at the market end of the line by way of educating the consumer in the economical use of horticultural products. There is no reason why the working man and his family should not enjoy many of the products of the soil that are now considered luxuries. The farmer as a rule does not give half the attention to his garden that he should, and a careful record has shown that the farm fruit and vegetable garden pay two or three times the profit of any other crop grown on the farm, unless it be the farmer boys who make the lawyers, statesmen and presidents of the United States.

This is a day of organized effort and even the horticultural interests are organized in some localities. Notable among these organizations is that of the California Fruit Growers' Association. But much remains to be done by way of organization and in many instances this may best be accomplished through the horticultural societies.

New and improved varieties are springing up under the efficient.effort of such men as Burbank, but the work is not for a few men but for the masses and if practical horticulturists are awake to the needs of the profession the results will be obtained.

After all, the greatest accomplishment along horticultural lines is found in the practical application around the home. It is not essential that a man should be a professional horticulturist in order that he can make his home surroundings both attractive and profitable. By home adornment I do not mean the collection and massing together in confusion of all sorts and kinds of plants having unpronouncable names, but the careful selection and economical use of a few plants that are well adapted to the conditions. Some of the best horticultural effects that I have ever seen consisted only of a clean, smooth and well kept lawn and a crimson Rambler rose on the veranda. But I did not intend to enter a discussion of any particular line of horticultural work, merely wishing to call attention to a few of the facts that influence the general conditions of the entire country.

In my travels I have abundant opportunity to observe the results of the carrying out of various plans and as a rule I am securing photographs to illustrate, and at some future time shall be pleased to give the Columbus Society the benefit of these observations. Sincerely yours,

W. R. BEATTIE.

Mr. Wm. R. Lazenby—Replying to your letter of the 6th, I cannot be at your meeting Saturday. I send a few notes below.

Last year's apples kept the best of any crop I ever had but I attribute a good part of it to the cool weather last fall and the other to the fruit being put into cold storage as soon as picked, and it was a good storage plant too. The latest kept brought the best prices. All that had good color when picked, kept it so they looked like fruit just taken from the tree. Possibly some of you saw some of them on the Columbus market. They were Rome Beauty and my name was on every barrel.

The new apple, Ensee, kept just as well as the Rome Beauty and it never lost any in quality and is just as good as last winter. I have a barrel yet in cold storage and there is a barrel in Columbus with one-third each of Rome Beauty, Ensee and York Imperial in care of the experiment station, and Prof. Green expects to hold them till the state fair to test them.

I still have a fair prospect for most all kinds of fruit and apples are as promising as the average for the past five years. I hope to have as many as last year, or more of winter fruit, but summer varieties may not be quite as plentiful. Peaches are fair crop, cherries were good crop and are about gone here; bring from $1.50 to $2.00 per bushel crate. Strawberries are not plentiful and prices are high. Other berries may be a little better.

The wet weather in May caused the apple scab to get very bad on the apple where not well sprayed and those who did not spray will have no good fruit. The best may have some scab on part of it. The rainfall here was 6.70 inches in May and at Ironton the papers stated it was 8.91 there. As most all my land is in grass I have not been injured much by the land washing, as have others in my locality. I still think that mulching the land is good for the orchards and shall continue it as best I can. The mice will injure a few trees where it is mulched and it should not be put too close around them. The soil is loose under the mulch and sometimes the mice work through the soil and gnaw the roots under ground and not at the surface. When ground is left bare it gets hard and mice will not work much in such places, neither will trees grow and do so well under such conditions. I think it better to have a small per cent. of injured trees among the good ones than to have all of them poor by not mulching or manuring. Spraying on land that is in grass or has a good mulch instead of being cultivated has been a nice job this wet season compared to what other orchardists have found in plowed land. There is more grass on the land this year than usual in many places and by letting it lie after being cut it should almost keep the trees from knowing when we have a dry spell later on.

As we have a good market for dropped apples in the fall the mulch keeps the fruit clean and it is worth more than what falls on the bare ground and gets dirty and bruised. It hangs on the trees better where mulched and gets a better color and it will sell better when put on the market and will keep later in the season.

Wishing you a good meeting, I am,
Yours truly,
U. T. Cox.

REPORT OF COMMITTEE ON EXHIBITS.

President W. R. Lazenby:

Your Committee on Exhibits submit the following report on the display of fruits, flowers and vegetables at the meeting of the Society, June 10:

Display of apples, first premium, F. P. Vergon.
Display of roses, first premium, Franklin Park Floral Co.
Display of roses, second premium, Mr. Charles.
Display of cut flowers, first premium, Mrs. C. E. Sharp.
Display of cut flowers, second premium, Mr. Charles.

Worthy of Notice:

Display of roses by the Misses Freda Detmers, Eleusina Lazenby, Sadie Ballou and Master Chester Clark; display of a specimen of clematis by Master Chester Clark.

Head of "Morse" lettuce raised by J. P. Streeper, Madison township, Fairfield county.

University exhibit—Bunch of palmetto asparagus, Crosby beets, a box of Copeland gooseberries, head of Ey. Jersey Wakefield cabbage, half-dozen evergreen spine cucumbers; lettuce, one head black-seeded Simpson, one of Big Boston.

Experiment Station Exhibit—A few specimens each of the following varieties of strawberries, Challenger, Oom Paul, G. W. Howard, Howard No. 2, J. J. Gill, Smith, Fairfield, Repeater; also of sweet cherries, Ida, Empress Eugene, Gov. Wood, Griffith; one specimen each of the following varieties of tomatoes: Beauty, Magnus, Dwarf, Champion, Rawson's Puritan, Stone, Dwarf Stone, Lorilliard, Chalk's Ey, Jewel, Success, Combination. A few specimens of White Spine cucumbers.

C. W. WAID,
Chairman Committee on Exhibits.

INSECTS INJURIOUS TO STONE FRUITS.

L. M. SMITH.

THE PEACH TREE BORER.

Having made quite an extensive study of the horticultural conditions of Ohio, there is no doubt in the mind of the author that the peach tree borer may be properly classified as one of our most destructive insect pests; and when those insects injuring the peach are considered alone, all commercial growers have come to realize the fact that the question of their success or failure depends very largely on their ability to master this one pest. Many orchards that are not killed outright are so weakened by this pest that they fall an easy prey to other insects, are badly winter-killed or are unable to withstand other unfavorable climatic conditions.

J. H. Hale said that "The peach borer has killed more trees than all other causes combined." And when we consider the fact that trees are very often attacked the first year in the orchard, or as is far too often the case are infested when sent out from the nursery, we may feel pretty safe in saying that comparatively few trees come to the age at which they will produce a good crop without having suffered more or less from this dreaded pest.

HISTORY AND DISTRIBUTION.

The peach tree borer is a native of America and so far has been reported only in the United States and Canada. The pest was known before the peach tree, which is a foreign plant, had been introduced and at that time fed on wild plum and wild cherry; but very little had been done in the cultivation of peaches in this country when the pest developed an appetite for the peach and preference to its former food plants. The following note is taken from Peter Kalm's "Travels into North America:"

"June 15, 1749. Peach trees have been planted here (Albany, New York) and never would succeed well. This was attributed to a worm which lives in the ground and eats through the roots, so the tree dies."

From this, which seems to be the first mention made of the pest on peach trees, we may suppose that some injury had been done almost 200 years ago or possibly at even an earlier date than that. The first attention was called to the insect in New York, but from there it spread rapidly in all directions until now it may be found to the north in Canada; to the east in the Atlantic coast states; to the south in the Gulf states and to the west in the Pacific coast states, though, in he latter states, it has done but little damage and it not to be confounded with the peach tree borer of the Pacific coast, which is a different but closely allied species (Sanninoidea opalescens).

LIFE HISTORY.

A great deal has been done in trying to successfully treat trees infested with this pest, but, so far, the methods have proven rather unsatisfactory, but before taking up the treatment it is necessary to study the life history. Perhaps the average grower does not know this insect in any but its larva stage; however, it, like all moths, butterflies, beetles and flies, has four distinct stages. The egg is laid by the adult; from this hatches the larvae, which does the damage to our trees; the larvae is transformed into the pupa or resting stage and from this the adult develops. The whole process of transformation requires a year's time, that is, there is but a single brood each year.

THE EGG.

As to the time of year the eggs are laid, there is a great variation, depending on the temperature of any particular locality; and there is usually quite a period of time through which the egg-laying extends. Copulation probably takes place, as a rule, soon after the adults emerge, and Slingerland records copulation as lasting for half an hour or more, and that a mated pair will fly from tree to tree meanwhile. Smith states that if the eggs are not fertilized by the male within twenty-four hours, the females lay them unfertilized to get rid of them. These eggs, of course, do not hatch, and this is possibly one of the main reasons why the number of borers is not far greater than it is, for a single female is known to produce very large numbers of eggs. In 1897 Smith dissected from a female only two hours old 500 eggs, with a hard brown shell, and 100 more white or less mature ones; and as many as 678 eggs have been reported as having been dissected from a single female. This seems to indicate that not nearly all of the eggs ever make mature insects, but just why this difference in number of eggs and adults seems to be an open question. The eggs are described by Slingerland as being .02 of an inch in length and a little more than half that wide, of a light chestnut or mars brown color and subellipsoidal in form, slightly flattened with an oval-shaped depression. One end of the egg is either squarely or somewhat obliquely truncate with a slight depression in the middle, where the micropyle is located. The whole surface of the egg is so sculptured as to have the appearance of being laid with irregularly shaped paving stones, the stones being separated by slight ridges.

The depositing of the eggs has been observed by a number of persons and they seem to be pretty well agreed that the most of the eggs are placed within eighteen inches of the ground, though they are often found higher sometimes even on the lower limbs. There seems to be no particular place preferred for the eggs, as some are found down in the crevices of the bark, some on the smooth bark and some among the lichens covering the bark. The eggs are stuck to the surface of the tree by a gummy secretion. Some have recorded them as being found singly, while others have found them singly and in groups of from three to ten. It is recorded of Walker, at Jamaica, Long Island, as having seen a remale laying eggs just after mating. "She moved about actively over every portion of the trunk, and even on the lower branches, touching her abdomen constantly to the surface. She was engaged in that way two hours and more. On examination he found the eggs laid in all sorts of places without special selection, singly or in groups." Records as to the time required for the eggs to hatch vary from seven to ten days.

THE LARVAE.

VE7 The young larvae get under the bark as soon as possible, and to do this, of course, seek the easiest place to enter but usually quite near where the egg was located and later migrate down the trunk to the base, where they continue to feed until cold weather begins. The size reached by the larvae in the fall varies in different sections; in some Southern localities they become almost grown in the fall, while in the Northern states some little more than get started in the fall. The mode of spending the winter depends, to some extent, on the size of the larvae. It is usually stated that the larvae comes to the upper end of the burrow and there makes a thin half cocoon-like structure in the gummy exudation at the surface of the tree, and there, in the so-called "hibernaculum," passes the winter. However, the author's observations indicate that in Central Ohio a large number of the larvae remain in the burrows through the winter. This is true of practically all of the larvae that are half-grown or more when winter sets in. While many of the smaller ones seem to winter on the surface of thee bark, without any "hibernalculum," but protected by the gummy exudation of the tree. As soon as warm weather comes in the spring the larvae begins its work again and then grows rapidly and does much damage, as large portions of the cambium layer are eaten away. A number of trees were treated by the author this year, the first of April, and at that time very little damage had been done yet this spring, though some were beginning to feed again. The mature larvae is almost white in color, has a reddish-brown colored head and almost black mandables. Its length is from an inch to an inch and a half. It has three pairs of jointed legs, one on each of the three thorascic segments, and five pairs of pro-legs, on the third, fourth, fifth, sixth and last abdominal segments. Both the true legs and the pro-legs are of a light brown color, the latter having two rows of recurved hooks on the first four pairs and a single row on the last pair.

As for the other stages no definite time can be given when pupation takes place. In the work here at Columbus this year none were found in the pupa stage until about the last of May, which seems to indicate that most of the pupations probably take place during the months of June. When full grown the larvae leaves the burrow under the bark and begins constructing a cocoon from small pieces of bark and excrement; these are fastened together with gum and the inside lined with silk. The cocoon, when completed, is a brown capsule, usually about an inch long. These are attached to the bark of the tree near the surface or may be just loose in the soil near the tree. The pupa is at first of a light brown color, changing to a very dark brown before transforming into an adult. Records as to the time spent in the cocoon vary from eight to twenty-eight days. Slingerland says "Our breeding experiments indicate that at Ithaca, New York, the insect is in its cocoon from twenty-five to thirty days, from three to five of these being spent as a larvae, thus making the pupal period about three weeks." In the pupa stage no food is taken, the insect lying quietly in the cocoon, but the tissues are gradually being transformed into the moth.

THE ADULT.

Records agree that the adults escape from the pupa cases in the daytime and usually in the morning, and contrary to the usual habits of moths, this one flies by day and very little, if any, by night, so the plan of trapping the moths does not work. This insect belongs to the family commonly called the clear-winged moths. The slender bodies and transparent wings of the adults give them a general appearance very similar to the common wasps. The differences in the appearance of the male and female are striking. The male has much the more resemblance to the wasps. Its general color varies from almost black to a deep steel blue, with a glossy lustre. The four wings are transparent, with a light tinge of smoky yellow; their veins, margins and fringes are steel blue, the margins are scaled, more or less, with yellow to dark brown. The yellow markings mentioned by Slingerland were not distinct in the museum specimens, which were used for study; but these light colored markings of the thorax and abdomen vary so much that a number of varieties have been described based on these differences alone. The males measure from three-fourths of an inch to an inch and a quarter from tip to tip of their expanded wings. The females are a little larger than the males, measuring from one inch to an inch and a half from tip to tip. With the exception of an orange-colored band on the fourth and fifth abdominal segments, the females are of the steel blue color; the front wings are opaque, being entirely covered with blue scales, while the hind legs are transparent over part of their area, but are covered with blue scales at the base and along the costal margin. The specimens studied here had both the fourth and fifth abdominal segments covered with the orange-colored bands. In the Southern States this band covers the fourth segment only.

TREATMENT.

In a general way we may say that the treatment of the peach tree borer has made but little advancement in the last century, as the present methods of treatment are for the most part only modifications of the methods that our grandfathers used. The treatment at once divides itself into two classes—the destructive method which aims to kill the insect in some way and the preventive method which aims to prevent the insect from entering the tree. Both these classes have had their friends and enemies, both have by some been considered entirely successful and by others, practically worthless. The best authorities today recommend a combination of the two classes, but do not claim complete success for either or for the two combined.

DESTRUCTIVE MEASURES.

"FREEZING OUT."

One of the first methods used to destroy the borer was that of "freezing out." This was done by removing the earth from around the base of the tree in the fall, leaving the base and upper surface of the main roots bare throughout the winter. This plan seems to have given some fair results but did not always kill the borers and very often exposed the tree to such an extent that they winter killed badly so the plan is seldom, if ever, used at the present time.

BOILING WATER.

The practice of removing the soil from around the base and applying hot boiling water is another of the early methods which we hear but little of now. Some use boiling water, others boiling soap suds. In 1806 Mr. Peters read a paper before the Philadelphia society for the Promotion of Agriculture, in which he said in part: "I have failed in many things in which others are said to have succeeded. Straw and bass or paper, surrounding the trees from the roots, at all distances from six inches to three or four feet, white washing, painting, urinous applications, brine, soot, lime, frames filled with sand, oil, tar, turpentine, sulphuric acid or oil or vitriol, nitrous mixtures and almost every kind of coating. * * * I have for a season or two amused myself with the persuasion that I had discovered an infallible panacea. I had temporary success, but finally disappointment. I removed the earth a few inches around the tree in August or September. I pour around the butt of the tree beginning about one foot above the ground, a quart or more (not being nice about the quantity) of boiling hot soap suds or water. This kills the egg or worm lodged in the tender bark and of course prevents its ravages the next year. I frequently plunge nursery stock into boiling water before planting."

CARBON BISULPHIDE.

When the author began studying the peach tree borer he was not aware than any tests had been made with carbon bisulphide and hoped that some valuable results might be obtained with this substance. But before any tests were made, attention was called to the fact that carbon bisulphide had already been tested and placed on the list of worthless remedies. However, a few trees were treated November 15, 1904. These were small trees which had just been set out the spring before but almost all were infested more or less, the number of borer ranging from one to five. The earth was removed from around the base and a common medicine dropper full of carbon bisulphide applied around the base and to the burrows where there were any. The time required to treat the trees in this way was estimated as being about half of the time required in the "digging out" method. Later the trees were examined and though an exact count was not made, certainly not more than half of the borders had been killed. On April 3, thirteen trees were treated as described above and the next morning the borers were dug out, of the thirty larvæ found, five, or one-sixth of the total number were still alive. The time required for this treatment was three and one-half minutes to the tree or a little less than half the time required to dig them out. In deep burrows where much cutting would be required to treat the trees with the knife, carbon bisulphide can be applied to the burrow with very good results but in such cases a sharp wire may be run into the burrow and the borer killed as easily as it can be done with carbbon bisulphide. A number of tests were made in bottles containing two cubic inches to see what amount of the bisulphide was required to kill borers. It was found that some larvæ would recover after having been treated with two drops for twenty-five minutes or when treated with three drops for fifteen minutes but in no case did any recover after having been treated with three drops for twenty-five minutes. A number of burrows were measured and their solid contents calculated which showed that the average contents of the burrows at the first of April, was about one-half of a cubic inch. Of course the carbon bisulphide would not be as effective in the burrows as in well-stoppered bottles, still if the bisulphide is applied directly to the burrows, there is no doubt but what the results will be fatal. In a letter from a California peach grower in 1898, he says, "Suddenly a new practice has begun here, the killing of peach borers with the fumes of carbon bisulphide. About two tablespoonfulls of carbon bisulphide are poured around the tree an inch away. This is done when the ground is dry so the fumes will percolate. The borers have been found dead after this dose. Although this method was originated only this fall, already the whole valley is either practicing it or are about to do so; the farmers cannot get bisulphide fast enough. Only a few wary ones hesitate lest they shall injure the trees. Rumors are afloat that some trees have been killed by the process; but the only case we have been able to authenticate is that of a man who says that the process killed 900 trees on almond roots." The dry loose soil of California is no doubt much more readily penetrated by the fumes than the ordinary soil of the east but on the other hand the borer of the Pacific coast works deeper into the wood than does the borer of the east and from that standpoint would seem to be harder for the fumes to reach. In the last few years there seems to be but little said concerning the bisulphide treatment. This is a dangerous method when used in any considerable quantity and after killing thousands of trees, the fad has gradually died out, though the California people still claim that good results may be had if used judiciously.

"DIGGING OUT" METHOD.

Of all methods in use at the present time, that of digging out is usually considered the safest and surest. The method is very simple as the name indicates. Most of the infested trees may be readily recognized by the gummy secretion at the base of the trees, often above the surface and almost always below the surface surrounding the infested part of the trees. This aids in locating the pest and after removing the surface of the soil with a hoe or spade, the burrows may be easily located and the larvæ soon dug out with a sharp knife or if the burrows are deep, a sharp wire may be trust into the borrow and the larva killed in that way. If the digging out is done while the larvæ are less than half grown, many of them will be found working around the base of the tree just below the surface and may be scraped off with a knife with little or no cutting of the wood. However, where considerable cutting must be done, if the trees are otherwise healthy, the wounds will soon heal and one should not hesitate to use this method. As to the best time for digging out the borers, opinions very; of course, the sooner it can be done after the eggs have hatched the less will be the damage done by the larvæ; but if the trees are treated at that time, one is very likely to overlook many of the smallest larvæ and these will develop and infest the orchard the following year. So that, if the borers are to be dug out but once in a year, we would recommend that it be done after most of the larvæ are half-grown, which for Central Ohio would be from the middle of April to the first of May. However, it is commonly recommended to go over the trees twice each year and where this is possible, much better results may be had. If the trees are to be treated twice a year, the first treatment should be given in the fall before much damage has been done; there is usually a period of from two to three months months during which the adults appear so that the larvæ are found in all stages of development; but at the fall treatment all of the larger larvæ will be taken and the next treatment may be postponed until late in the spring, say from the middle of May to the middle of June. In this way practically all of the borers will be prevented from maturing and if all of the orchards in any given locality are treated in this way, leaving no old snags untreated for the borers to develop on, there seems to be but little doubt that the ravages of the pest might be kept at a minimum if not entirely eradicated.

During the last two days of March and the first four days of April, the author, with the aid of an assistant, treated 654 trees by the "digging out" method. The orchard worked on was on he home farm of Professor H. C. Price, located five miles northwest of Newark, Ohio. The orchard is on a high hill, and no other peach trees in the immediate vicinity. The borers had been treated by the "digging out" method two years before and a wash made of soft soap applied. Since that time nothing had been done with the borers. In our treatment last spring, we kept a careful record of the number of borers, the size of the same, the number of infested trees, the number of trees not infested and the number of trees that had been infested but were not at that time. The summarized results obtained were as follows:

The number of larvæ almost grown	107
The number of larvæ half grown	223
The number of larvæ one-fourth grown	225
The number of larvæ	555
The number of trees having one larvæ to the tree was	153
The number of trees having two larvæ to the tree was	78
The number of trees having three larvæ to the tree was	29
The number of trees having four larvæ to the tree was	19
The number of trees having five larvæ to the tree was	88
The number of trees having six larvæ to the tree was	1
The number of trees having nine larvæ to the tree was	3
Total number of trees infested	291
Total number of trees not infested	363
Total number of trees that had been infested but were not at the time of our treatment	248

From these figures we find that about forty-five per cent. of the trees became infested in two years; and if the trees had not been treated this year, the gain would naturally have been much greater than either of the past years and we would not have been surprised to have found almost every tree infested if they had not been treated for three years in succession.

PREVENTIVE METHODS.

The preventive methods may in a general way be divided into three classes: First, applications that are intended to act as repellants, keeping the female from laying eggs on the trees; second, applications intended to poison the young larvæ, and thrid, applications which will harden the trunk making it inaccessible to the young larvæ.

REPELLANTS.

It may be mentioned here that in the early treatment of the borer various plants around the tree were thought to act as repellants. The principal plants that were used in this way were tomatoes, tansy, red cedar and wormwood. There seems to be no substantial records to prove any good results from this method. Experiments were also tried in placing various substances as salt, soot, slacked lime, flowers of sulphur, kainit, salt peter, coal screenings and ashes around the base of the tree, but so far no results of any importance have been obtained. Slingerland reports that from two-thirds to five-sixths of the borers were kept out in 1895 and 1896 by winding cigar stems thickly and close around the base of the trees from the roots to a little above the surface of the soil. Just what the action of the tobacco is seems to be a little doubtful. Slingerland thought possibly the odor was offensive to the adult or perhaps the liquid leaching out of the stems by rains might kill the young larvæ.

THE MOUNDING METHOD.

The mounding of the trees to keep the borers out is another very old method. It was used more than a hundred years ago and had been advocated as much if not more than any other method. In some localities it has been claimed to be a complete success; but from the fact that at the present time it is used but little seems to indicate that after all it was not of any great importance. The plan was to make little mounds around the base of the trees, some mounding to a height of only six or eight inches, while others made the mounds three feet high. In the American Entomologist the method used by B. Pullen, of Central Illinois, was discussed. He did not mound the trees until they were four years old as he said that the bark of the young trees is so tender that a single borer will almost girdle it; but in April of the fourth year he mounded the trees from ten to twelve inches and then kept adding a little soil each year. In the same article the method used by E. A. Thompson, of Hillside, Ohio, was give. He planted his trees in the fall and the following spring cut them back to six inches above the bud, then allowed from three to six branches to grow. But a second summer he plowed on both sides of the tree turning the furrows toward the tree which were then hilled up one foot. In the fall he trimmed back about one-third of the years growth and the next spring or summer the mound was raised another foot and the following summer the mound was completed by raising it another foot, making the finished mound three feet in height and six feet broad at the base. The mounds were not removed during the life of the tree. Both of the above men claimed to have had complete success in keeping out the borers. Later experiments have shown that the mounding does keep out some borers. Slingerland thinks about one-half of the borers might be kept out in this way. It is a cheap method and if used in connection with digging out, might be found worth at least all it costs. It is generally believed that the mound prevents the female from depositing her eggs on the trunk of the trees. This would seem very probable, at least in the case where the mounds were three feet high.

BANDAGES.

Another of the early methods was banding with various things as straw, rags and paper. Various kinds of paper have been used, as newspaper, roofling paper and tarred paper. The experiments seem to show that the various forms of bandages act only as mechanical barriers and where paper is used, just ordinary sheet paper would likely give about the same results as tarred paper if it stayed intact equally as well. This is, of course, a very cheap method and the results gotten from its use indicate that it is a good way of treating the borer. Cordly, in Oregon Experiment Station Bulletin 45, mentioned this as being one of the very best methods of treating the Pacific coast borer.

WIRE CAGES AND WOODEN WRAPPERS.

Of the various contrivances used as barriers to keep out the borers, the wire cages and wooden wrappers have been used successfully by some and are at present recommended. Stedman (see Missouri Experiment Station Bulletin 44) used both the wire netting and thin wooded wrappers with equally good results. In using any such barrier the bottom is pushed down into the soil and the top well packed around the trunk of the tree with cotton, to prevent the entrance of the adult or the young larvæ. Where boxes have been left open at the top, the results have been worse than on untreated trees, the boxes apparently serving as a protection to the borers. It is interesting to notice that Slingerland got results directly opposite to those of Stedman, when testing the use of wire cages. The cages were made and applied as Stedman had directed, but the results showed that there were about twice as many borers in trees thus treated as in the untreated trees near by. Slingerland did not recommend the use of the wooden wrappers, though his results showed that they were quite effective in keeping out the borers.

THE USE OF WASHES.

The various washes which are used may be divided into three classes, first those mixtures applied to the trunk intended to act as repellants, keeping the female from depositing her eggs on the trees; second, washes intended to poison the young larvæ as they work their way through the bark; and third, washes which harden on the bark, making it inaccessible to the young larvæ. The washes must be applied just before the adult begins to appear and must be kept in effective condition for three months or possibly a little longer time than that.

As this study of the borer has not been carried through a summer season, the author has made no experiments with washes; but a number of washes which have been in use, will be mentioned here. Hale's wash is one that has been very widely recommended as being obnoxious to the adult females, it is given in Trans. Mass. Hort. Soc. for 1888, Part 1, p. 66, as follows: For a fifty-gallon cask use twenty-five pounds of caustic potash, three pounds of white arsenic, two gallons of crude carbolic acid with water and lime or clay to make a thick wash. The repellant effect was supposed to come largely from the carbolic acid. But in Slingerland's experiments he thinks the carbolic acid has little or no effect. Another wash that has been recommended for this purpose is, one pint of crude carbolic acid and one gallon of soft soap. Thin the soap with a gallon of hot water and add the acid, after standing several hours add eight gallons of soft cold water.

Of the washes intended to poison the young larvæ there has been various mixtures recommended, the poison added usually being Paris green. Those who have observed the young larvæ carefully, say that this remedy is founded on a false theory, for the young borer does not eat its way through the bark if there is any other chance to get beneath the bark, and there will usually be found small crevices through which the very small larvæ will be able to pass. Then the Paris green is thought to injure the trees in some cases so that this treatment is not to be recommended. The washes used to harden on the tree preventing the entrance of the young larvæ, are the cement washes. One has been used some, made of sweet milk and ortland cement, but the results have not shown that the remedy is of much value, though theoretically it would seem to be ideal as a mechanical barrier.

After considerable experimenting, Stedman (Mo. Expt. Sta. Bull. 44) recommends the following wash as being the best: Dissolve as much common washing soda as possible in six gallons of water, then dissolve one gallon of soft soap in the above and add one pint of crude carbolic acid and thoroughly mix; slack a quantity of lime in four gallons of water so that when it is added to the above the whole will make a thick whitewash; add this to the above and mix thoroughly and finally add one-half pound of paris green, or one-fourth pound of white arsenic and mix it thoroughly in the above.

The best preparation to apply to the trees as recommended by Slingerland is gas tar, a thin coat being applied with a brush; this kept out from four-fifths to all of the borers and did no injury to the trees, though he advises one to be careful when first trying the tar, as some have killed their trees in this way. This may have been due to applying it to young trees that were not well established in the soil.

The following list shows the materials used by Slingerland in his experiments on the borer: Substances whch injured or killed the trees and are therefore classified as dangerous:

Paris green and glue.
Raupenleim.
Dendrolene.
White paint.
White paint and paris green.
Printers' ink.
The following list was ineffectual or useless:
Wire cages.
Carbon bisulphide.
Asafœtida and aloes.
Lime, salt and sulphur wash.
Resin wash.
Hard soap.
Tallow.
Whale-oil soap.
Whitewash.
Lime and linseed oil.
Hydraulic cement washes.
Pine tar.

Hale's wash (one application).

The following methods proved to be quite successful:

Hale's wash (two applications) kept out 1-3 to 1-2.

Moulding kept out 1-2 to 7-10.

Tarred paper kept out 1-2 to 7-8.

Tobacco stems kept out 2-3 to 5-6.

Coal or gas tar kept out 4-5 to all.

In conclusion, we would say that though the peach tree borer has not been controlled successfully as yet, there seems to be little doubt but what the ravages may be kept at a minimum by using the "digging out" method combined with good preventive method.

We must remember that the only practical time to combat the pest is during its adult and larva stages, and must be ready to do the work at the right time and in the right way if we would have success.

THE PLUM CURCULIO.

The plum curculio belongs to the peculiar family known as the snout beetles, the name coming from the prolongation of the head into a beak or snout, which in some species is longer than the remainder of the body. The small mouth parts are situated at the end of this snout. Both the adult and larvæ are vegetable feeders, the larva a footless, whitish colored grub, feeding within the young fruit of a number of species. This is the pest that causes the plum to drop so badly and produces the wormy cherries that are so very common.

DAMAGE DONE.

The damage done by the curculio is hard to estimate, but it ranks very high among the pests destructive to the tree fruits, there being scarcely any of the common tree fruits but what are damaged more or less. The injury done to apricots is often quite severe. This is probably due to the fact that the apricot blossoms earlier, and for several days is the only fruit large enough for the curculio to work on. In this section the damage to plums is doubtless much greater than that of any of the other fruits, as the apricot and nectarine, which are two of the fruits most likely to be chosen by the pests, are but little grown. The injury done to the plum is very noticeable because the larva eats right to the stone and feeds around it or in it to such an extent that the fruit almost always drops to the ground. In the case of peaches and cherries, the falling of the fruit at the time of the maturing, is almost as indicative of the injury done as though the fruit had fallen before ripening. Pears and quinces are not usually damaged to any great extent by the plum curculio, but apples labeled with the curculio's characteristic mark are very common. The apples do not fall and often will make fair fruit at maturity; but we can not hope to get perfect apples after they have been punctured by this pest. The larvæ seem to die before reaching the vital parts of the fruit in many cases, but even if there is no damage done except the puncture made by the adult beetle, the fruit is likely to be unsalable as the crescent-shaped scar widens with the growth of the fruit, leaving a blemished surface and very often the shape is distorted and the result is poor, gnarly apples where smooth, perfect fruit should have been obtained.

LIFE HISTORY.

The presence of the curculio is easily ascertained by the peculiar crescent-shaped scar which it makes in the fruit. The adult beetle begins its work early in the spring, soon after the blossoms fall. By means of her snout the female beetle bores a small hole into the fruit, then carefully places an egg within and makes the familiar incision which undermines the egg, leaving it in a flap apparently to prevent it being crushed by the growing of the fruit.

The egg is quite small though visible with the naked eye, oblong oval in shape and pearly white. The average time for the eggs to hatch is about a week, the time required being a little longer in cool weather and not quite so long in warm weather. L. R. Taft says: "The small, footless larvæ eat into the fruit and around the stone, never entering the stone, and reach their full size in from three to five weeks when they leave the fruit and go into the ground about five inches, where they pupate, four to six weeks being required until they appear as full-grown beetles." The beetle is one-fifth of an inch long or a little more. Its color is a brownish gray. There are a number of short ridges on the wing covers and also on top of each one is a dark brown hump which is a distinguishing character. The snout is almost one-half of the length of the remainder of the body, and is curved down and back towards the thorax. The adults hibernate under rubbish of some sort soon after they have matured and do not appear again until the following spring.

The time at which the adults appear in the spring, varies with the general climatic conditions. During a very warm spring some would doubtless come out during the month of April in central Ohio. The author was surprised on going out the sixteenth of May this year to find that not only had many plums been stung and eggs laid, but already the eggs had commenced to hatch and in one case a good-sized larva was found feeding around the center of the plum. And on the first of June rotting had commenced and many plums had fallen to the ground.

TREATMENT.

The treatment of the curculio, like that of the peach tree borer, has been on the whole rather unsatisfactory. There are two general methods used: poisoning the beetles by the use of sprays, and jarring them from the trees.

POISONING.

This remedy is based on the fact that the adult insect feeds more or less on the leaves and young fruit before the eggs are laid. There is no method of poisoning the larva, for the eggs are placed beneath the surface and as soon as the egg hatches, the little larva eats its way right into the fruit. The poisons used are paris green and London purple, at the rate of one pound to two hundred gallons of water. Since the composition of these substances vary, there has often been damage done by getting the sprays too strong and scorching the foliage. To prevent this it is well to add a little lime to the solution, or when spraying with Bordeaux mixture, add the poison to the Bordeaux. In this way the curculio and codling moth may be treated when the trees are sprayed for fungus diseases with very little additional cost. Spraying should not be done while the trees are in blossom, as many bees will be killed by the poison. The first spraying should be done just before the buds open and again as soon as the bloom falls. Fruit growers who are coming to use this method claim that though not all of the work of the curculio will be prevented, the fruit destroyed by the remaining curculio will not be more than enough to properly thin the fruit, if there has been a good stand to begin with.

JARRING METHOD.

The jarring method for the curculio, like the digging-out method for the peach tree borer, is the simplest, yet the safest and surest. This is easily accomplished on account of the peculiar habit the curculio has of losing its hold, doubling up its legs and dropping to the ground as if dead when the trees are given a sudden jar. Just shaking is not effective, but a sudden blow causes the insect to drop at once. The best results are gotten in the morning while it is cool as they can not fly so readily then. Various contrivances have been used. Some have placed sheets of some light material on frames which are carried about from tree to tree and the curculio jarred onto them. Another method is to mount a sort of an inverted umbrella on a wheel, making a sort of a wheelbarrow which is wheeled about from tree to tree. The jarring is done by means of a pole padded with rubber or some other material or a good-sized branch is sawed off, leaving a stub which may be struck a sharp blow with an ax. Jarring is stopped occasionally and the insects killed or in case of the inverted umbrella, there is an opening at the apex under which is hung a can or bucket containing some coal-oil, into which the curculio fall and are soon killed by the oil.

The main cause for poor results in treating the curculio is that very little care has been given to the work, and in many orchards no treatment at all has been given. The jarring method, if commenced in time and used every day or two while the adults are coming out in the spring, has proven very successful. As yet the experiments with spraying are comparatively few, but where thorough spraying has been done two or three times as directed above, good results have been obtained.

THE INSECTS AFFECTING THE BLACK LOCUST.

INTRODUCTION.

THE JOURNAL gratefully acknowledges the loan of the cuts appearing in the article on Insects Affecting the Black Locust by E. C. COTTON, by the DIVISION OF NURSERY AND ORCHARD INSPECTION, Ohio Department of Agriculture.

cially under Ohio conditions.

There is in the state a large area of land that is too poor and rough for profitable agricultural operations, which will, if simply left alone, grow black locust trees of merchantable size in from ten to fifteen years.

In spite of its many good qualities the black locust is not planted extensively, because it is subject to attack by several serious insect enemies. In some sections these pests are so numerous, and their work so thorough and persistent, as to render it impossible to grow this tree. The trunk and branches are sometimes injured by boring larvæ to such an extent as to cause death, or so weakened that they are readily broken off by the wind. The leaves are eaten by a large number of insects, but serious damage is confined to a few species. The buds are often injured by a species of curculio. Serious damage from this source is comparatively rare, but the writer has observed cases where so many of the buds were destroyed by these curculios as to practically prevent the production of seed.

In the preparation of this bulletin several references were found of insects feeding upon the "locust," and where it was not clear which species was referred to they were not included. The references given in the bibliography which follows each insect are those which have a direct bearing upon it as an enemy of the black locust. In some cases the description of the insect in one or more of its stages, notes on its life history or its natural enemies, are included.

Dyar's List of North American Lepidoptera was used as a guide in correcting the specific names of the insects belonging in that order and in referring them to their proper genera. In Coleoptera Henshaw's List of the Coleoptera of America, north of Mexico, was followed, and Mrs. M. E. Fernald's catalogue of the Cocoidæ of the World was consulted in naming and arranging the scale insects.

THE LOCUST BORER.

Cyllene robiniae Drury.

This insect is one of the most destructive enemies of the locust tree. Its attack is so insidious, and the injury done is so inconspicuous until the damage is complete, that it is not often noticed by the casual observer, and fine trees or plantations may be almost ruined before the owner knows that any injury is being done. So far as the writer's personal observations go, the injury is greater in single trees planted for ornamental purposes and plantations of considerable size than in natural forests. This is probably due to the fact that, in the latter case, the injury is distributed over a large number of trees, and therefore less attention is given to any one. In many parts of the state where the trees are plentiful and grow thriftily the damage is less apparent, as the growth is rapid enough to heal over the injury caused by the larvæ.

In this state a black locust tree without one or more dead patches on its trunk, caused by the workings of these insects, is the exception rather than the rule. The writer has seen plantations in which the trunks of nearly all the original trees had been killed by these larvæ, and sprouts thrown up from the lower part of the trunks had been in turn destroyed; and in extreme cases the same fate had overtaken the second set of sprouts, none of them growing larger than three inches in diameter and being so thoroughly tunneled as to be worthless, except for firewood.

The present geographical distribution of this pest is practically the same as that of its host. Forster mentions this insect as an enemy of the locust, in New York, about 1766, and it has gradually advanced westward and southward with the spread of the tree. It was first noticed in large numbers on the black locust trees at Rock Island, Ill., in 1863, and during the two following years completed the destruction of nearly all the locust trees in that city.

Harris describes this insect as follows:

> "The adult insect has a velvet-brown body, ornamented with transverse yellow bands, of which there are three on the head, four on the thorax, and six on the wingcovers, the tips of which are also edged with yellow. The first and second bands on each wingcover are nearly straight; the third forms a V, or, united with the other, a W; the fourth is also angled and runs upward on the inner margin of the wingcover toward the scutel; the fifth is broken or interrupted by a longitudinal elevated line; the sixth is arched and consists of three little spots. The antennae are dark brown, and the legs are rust red. The insect varies from six-tenths to three-fourths of an inch in length.

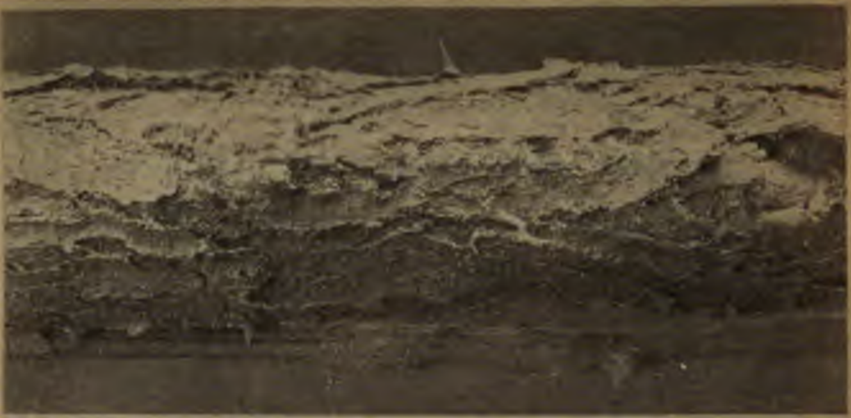

Fig. 1.

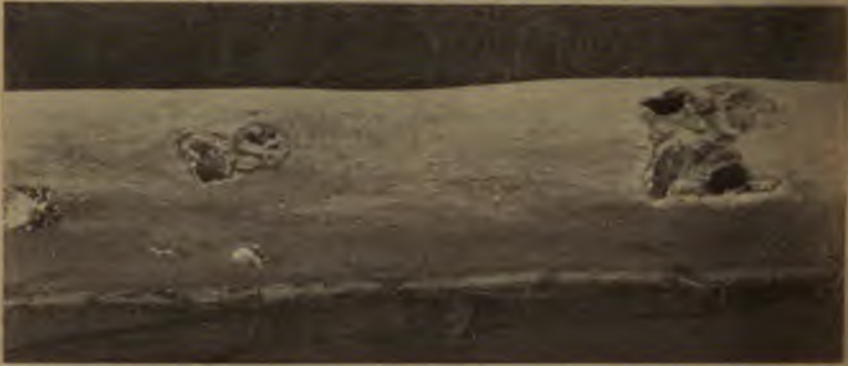

Fig. 2.

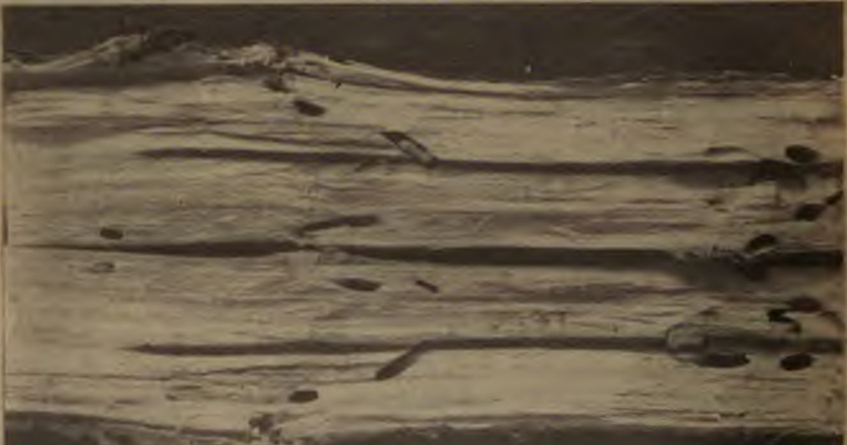

Fig. 3.

FIG. 1. Section of stem of a small black locust tree, showing sawdust thrown out by larvae of the Locust Borer (*Cyllene robiniae*). Natural size. (Original)

FIG. 2. Same as Fig. 1 with bark removed. Natural size. (Original.)

FIG. 3. Same as Fig. 1, split showing larvae of the Locust Borer (*Cyllene robiniae*) in their burrows. Natural size. (Original.)

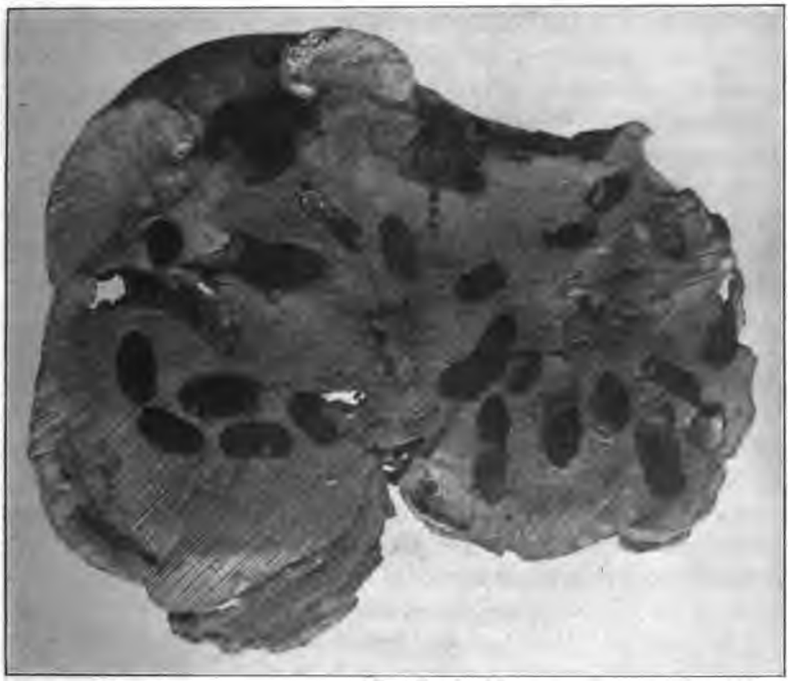

Fig. 4. Cross section of small black locust tree showing injury caused by larvae of the Locust Borer (*Cyllene robiniae*). (Original.)

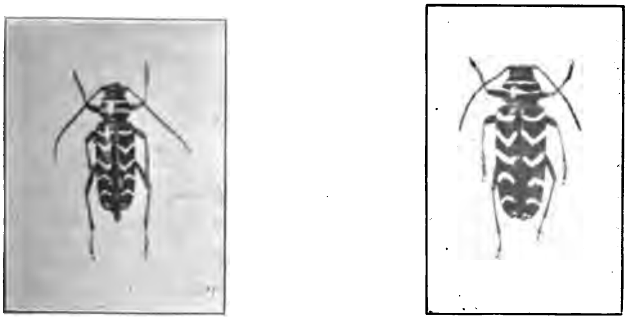

Fig. 5. Adults of the Locust Borer (*Cyllene robiniae*):—a, male; b, female. Natural size. (Original.)

This insect has been confused by many with the painted hickory borer, (*Cyllene pictus*), from which it differs in the following manner: Antennæ and legs are more slender and shorter; posterior end of the body tapers to a less blunt point. There is also a considerable difference in the host tree and time of emergence of the adults, the hickory borer inhabiting the hickory and appearing in May and June (adults of this species were captured near Columbus, May 1, 1905), while the locust borer feeds in the stems of locust trees and does not emerge until late in August or September.

During September the adult beetles may be found feeding upon the flowers of the golden rod, where their colors so successfully mimic those of the flowers as to partially protect them from insectivorous birds.

Shortly after emergence they pair, and the female, accompanied by her mate, creeps over the bark of the locust trees, searching the crevices with her antennæ, and dropping therein snow-white eggs, in clusters of seven or eight, and at intervals of five or six minutes, until her entire stock is safely stored. The eggs soon hatch and the larvæ burrow into the bark, feding upon the soft inner bark and remaining there during the winter. At this time many of them have attained a length of half an inch. In the spring active operations are resumed, but the larvæ burrow through the inner bark into the sap wood. They are voracious feeders and grow very rapidly. The general course of their winding burrows is in an upward direction from the place of entrance. In this latitude the work of the larvæ is first noticed about May 1st by the oozing of the sap from the burrows, and later by the sawdust which is thrown out. One can readily determine when the larvæ have reached the sap wood by the change in color of the chips. Those from the bark are brown, while those from the sap wood are white. For a time they force the chips out as fast as made, but the passage often becomes clogged and the burrow filled with the fibrous material. In such cases the larvæ make another opening through the bark. They become full grown about July 20th, and soon pupate, the adult beetles leaving the trees early in September.

The body of the mature larva is about one inch in length, cylindrical or slightly flattened, whitish in color, with three pairs of brownish-black legs on the thoracic segments; legs conical, short and terminating in a slender point; mouth parts brownish-black.

REMEDIES.

On account of the nature of the work of the larvæ, very little can be done in combating the pest, except applications made to prevent egg laying. With this end in view, numerous substances have been tried by different experimenters, but no specific has been found. Washing the trunks of valuable trees with soft soap solution late in August or September has been recommended. The effectiveness of this preparation is based upon its repellant properties, and partly upon the fact that any soapy, oily or greasy substance, when applied to the bodies of insects, will close the breathing pores, thus smothering them. Whitewashing or coating the trunks of trees with grafting wax has also been recommended. Of these remedies, whitewashing will probably be more effective, especially if some repellant, such as whale-oil soap, be added. This solution can be applied with a spray pump very effectively, and at small expense.

THE LOCUST TREE CARPENTER-MOTH.

Prionoxystus robiniae Peck.

The larva of this insect is, perhaps, next to the locust borer, the most destructive of the locust-infesting insects. This pest is known to exist from Maine to Texas, and has also been observed in California. It may eventually be found to prey upon forest trees in all parts of the United States where the black, red and white oak and locust trees grow. We may safely assume that a considerable portion of the damage now attributed to the locust borer (*Cyllene robiniae*) would, if carefully examined into, be rightfully charged to this insect. It is capable of doing greater damage to the trees because of the larger size of the tunnels which it makes, these being from one-half to three-fourths of an inch in diameter, and because the greater portion of the larval life is spent in the heart wood. On account of the work being entirely within the body of the tree, it is very difficult to discover until the insect has reached maturity. As it requires three years to attain its full growth, and during this time is tunneling through the heart wood, the damage may be great enough to destroy the commercial value of the wood for sawn lumber. It also renders the wood less valuable for posts, poles and other forms of structural timbers, as these large tunnels not only weaken the stick but also allow the free entrance of water to the very heart of the timber.

Besides the three common forms of oaks and the locust, enumerated above, the larvæ of this moth is reported as inhabiting the willow, poplar and chestnut.

The pupa transforms to the adult in June or the forepart of July. The adult flies only at night, remaining at rest during the day, clinging to the trunks of trees, the bark of which the gray color of its wings and body so closely resembles. When in repose its gray wings are folded, roof-like, over the body in such manner as to render the whole insect very inconspicuous.

The male moth is much smaller than his mate. Head and thorax gray, marked with black; abdomen black, with dull yellow sutures; legs black. The black ground color of the forewings is thickly sprinkled with white scales, forming gray spots, or clouds, which are netted with black lines. The hind-wings are black, with the posterior half of a rich yellow color, bordered with a black line upon the hind margin.

The female moth is paler gray, the hind-wings entirely destitute of the bright yellow color of the opposite sex. The body is densely coated with gray scales, the under side being hoary white; the legs are gray, with black bands.

Soon after emerging the female deposits her eggs, which, according to different authorities, vary from three hundred to one thousand. They are dropped into cracks and crevices in the bark, without other protection than the glutinous substance with which they are covered, and which dries and hardens immediately upon exposure to the air. These eggs, which are of a dirty white color, with a black spot at one end, and finely reticulate, are about one-tenth of an inch long by three-fourths as thick. Because of their large size the eggs are an easy prey to birds, and this perhaps explains why, in spite of the great prolifiacy of the females, the damage occasioned by the larvæ is not greater.

Upon hatching, the larvæ work their way into the soft inner bark, where they feed until their jaws have attained strength enough to attack the harder sap wood, finally reaching the heart wood, where they feed until nearly mature. They seem to prefer the living wood to that which has begun to decay.

Before maturnity the color of the larvæ is cherry-red, marked with a faint yellowish stripe along the back. After the last molt the bright red color changes to white, with green markings. The head is a tawny yellow with black mouth parts; body nearly cylindrical, somewhat flattened below, with scattered, long, fine hairs. At maturity it measures from two to three inches in length by one-half inch in diameter.

Before changing to the pupa state the larvæ bore through the sap wood, or inner bark, and the outer bark except a very thin shell; they then retire about three or four inches into the burrows, spin their cocoons, and transform. When ready to emerge, the pupæ force their way, by means of the backward projecting spines on the abdomen, to the mouth of the burrow, where the empty pupæ cases may be found hanging from the opening. The pupæ are about an inch and three-fourths long by about half an inch thick, and of a dull chestnut color.

Because of the nature of the work of this pest, the treatment must be largely preventative. The treatment suggested for the locust borer would probably be as effective here as anything, the only modification necessary being to make the applications during the latter part of June or July, instead of August and September.

The Locust Hispa.

Odontota dorsalis Thumb.

This insect is a native of North America, and is known to occur in the New England, Middle and Western States. Although attacking the leaves only, it is nearly as destrictive to the trees as the locust borer, for this tree, unlike the elm and several others, does not put forth a second crop of leaves in any given season, if the first be destroyed by insects or other agencies. In many portions of Ohio the injury done by this pest is very great. It is especially noticeable along the Ohio river from Ironton to Gallipolis, and was particularly severe near the latter place during the seasons of 1904 and 1905. During the latter part of July and August and early September, locust groves appeared as if scorched by fire, practically all of the leaves being mined and skeletonized. Infested thickets located upon the hillsides could be distinguished, several miles distant, by the brown and seared appearance of the foliage.

The adult beetles may be found on the leaves of the black locust from early May until October, but are most abundant during the latter part of July and August, at which time the first brood has maturned. The beetles are usually seen apparently motionless upon the surface of the leaves, but closer examination will show that they are busy feeding. At first, oblong holes are eaten, but later in the season the leaves are simply skeletonized from the upper side. While eating, the beetle rests upon its forelegs, the body extended at an angle of about sixty degrees from the surface of the leaf. At night, during rainy weather and during oviposition, they are to be found on the under sides of the leaves..

But brief mention was made of this insect in Packard's Fifth Report of the U. S. Entomological Commission. Apparently it was not considered of any great economic importance, but since that time it has attracted considerable attention, having been the subject of a special treatise by Mr. F. H. Chittenden, in which he records serious damage to locust trees near Washington, D. C. The first serious injury was reported from Frankfort, Ky., in 1868, where the beetle was said to have completely eaten the leaves off of the black locusts, in some instances killing the trees. (Bulletin 38, n. s., U. S. Div. Ent.) It has also been prominently mentioned among the destructive locust pests of Kentucky and West Virginia.

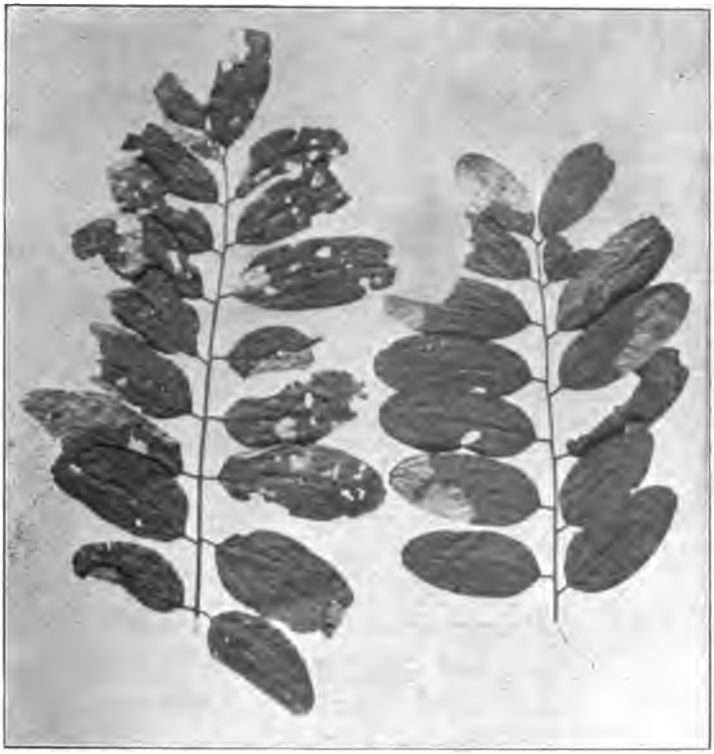

FIG. 6. Black locust leaves showing injury caused by larvae and adults of the Locust Hispa (*Odontata dorsalis*). (Original.)

In 1896 is was reported by Prof. Webster as defoliating the locust trees in Brown, Clermont and Hamilton counties, Ohio, and he states that "the same conditions were true of the adjacent portion of Kentucky."

The adult beetle is somewhat flat in form; tawny-yellow above, with a black strip down the middle of the back, usually occupying about one-half of the total width; the wing-covers have ten longitudinal series or rows of punctures, and three of the interstices form elevated ribs.

The insect winters in the adult stage, and the eggs are laid on the young leaves the following spring. The eggs, which are white, short and disc-like, with a thin shell, are deposited in masses of five or six. They are placed in a row, the flattened surfaces touching, and are covered with a brown shellac-like coating, by which they are protected. On hatching, the young larvæ break through the under side of the egg case and burrow into the leaf tissue below. For a few days these larvæ occupy the same burrow but usually all, except one, migrate to other leaves and form mines in the tissue. The mines are quite characteristic, and may be distinguished from those of other leaf miners on the locust. The larvæ consume the whole of the parenchyma, of that portion of the leaf attacked, making an irregular mine equally visible from either the upper or lower surface. Tineid larvæ eat only the parenchama of the upper surface of the leaves, so that the mines are visible from that side only.

The mature larvæ are elongate, slightly tapering posteriorly; color yellowish-white; the head and legs brownish, immature larvæ slightly lighter in color; segments of the body tuberculate on the sides.

The pupæ are at first whitish, later becoming a rich honey color. They are more convex and shorter than the larvæ, but resemble them otherwise. The tubercles still persist, and each is furnished with two or three bristles, which, together with several spines and tubercles on other portions of the body, enable them to move about in the mines quite rapidly.

In Ohio there are probably two generations, especially in the southern portion, while in more northern regions there is probably but one. At Columbus, June 24, 1905, a large number of egg masses were found, a few of which had hatched, and on July 29, near Logan, Ohio, several mines were opened and found to contain larvæ in all stages, as well as pupæ. A considerable. number of nekly-laid egg masses were also noted. At New Concord all stages of the insect were found on September 6, 1905, and one newly-laid egg mass was observed.

The insect has quite a wide range of food plants, having been observed feeding upon the leaves of white oak, beach, birch, hawthorn, aple, crap-apples, the tender leaves of *Ulmus americana* and the red oak. It also feeds upon herbaceous plants, as quite large numbers of them were seen by Mr. Chittenden feeding upon colver plants growing under locust trees at Cherry Dale, Va. They are also known to feed upon the hog peanut (*Falcata comosa*) and the soy bean.

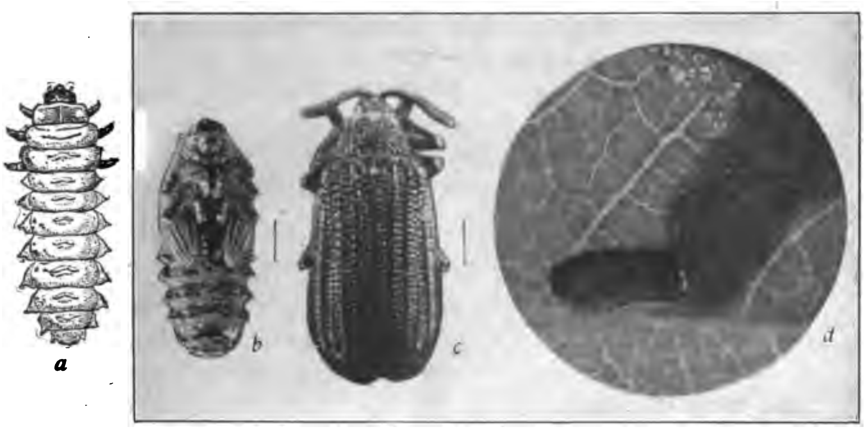

FIG. 7. The Locust Hispa (*Odontata dorsalis*); a, larva (from Chittenden, Bul. 38, (n. s.) Div. Ent. U. S. Dept. Agri.); b, pupa; c, adult; d, egg mass and beginning of mine (shaded portion) on locust leaf. Greatly enlarged. (Original.)

NATURAL ENEMIES.

Dr. Howard reports four parasites which he has been able to rear from larvæ and eggs of this insect, and one possible secondary parasite.

Triehogramma odontotae How. Reared from egg masses. In nearly every case where one egg was parasitized, all of the eggs in the mass were similarily attacked. The adult parasite gnaws its way out through the leaf, emerging from the upper surface.

Derostenus primus How. A chalcid reared from egg masses, but is thought to be a secondary parasite on *Trichogramma odontotae.*

Sympiezus uroplatae How. A hymenopterous parasite, the white larvæ of which was found feeding externally upon the larvæ of *O. dorsalis.*

Spilochalcis odontotae How. Seen emerging from pupa of *O. dorsalis.* This is an internal parasite.

Ichneumon hispa Harris. Bred from pupa of *O. dorsalis.*

The young larva of the wheel bug (*Prionidus cristatus*) is also reported to feed upon the larvæ and adults of this species. They kill the larvæ by piercing them with their beak through the epidermis of the leaf.

REMEDIES.

In spite of the fact that this insect is a very serious pest, little has been done in the way of attempting to control it. One of the remedies suggested is the burning of all the leaves and trash under the trees late in the fall in order to destroy the hibernating adults, but, judging from observations made by the writer in April, 1905, little can be accomplished in this way unless the material is very dry. On April 3 several adults were found at Leesburg, Ohio, in the fine leaf mold just at the surface of the soil. As this material is generally damp it will not readily burn, and the burning of the leaves and coarser rubbish above would not seriously affect the insects. Furthermore, it is very poor policy to destroy the natural protection to the soil late in the fall, leaving the ground bare over winter.

A study of the life history of this insect, together with its method of feeding, seems to indicate that the weakest point in its life, and the one that can be most easily and effectively attacked, is during the adult stage. This period covers that time from the first appearance of the adults in the spring until egg laying, which begins about the latter part of May. During this time the adults are feeding upon the leaves of the trees, and generally upon the upper surface, so that a thorough application of an arsenical poison should be effective. This treatment would not be practicable for application on large forest areas, but in those cases where a few locust trees are grown for ornament, or small commercial plantations are being cultivated for posts or poles, such applications might be advisable.

THE LOCUST TWIG BORER.

Ecdytolopha insititiciana Zell.

The injury occasioned by the larvæ of this Tortricid is very common, and is characteristic for the species. In many sections a large proportion of the young locust shoots are seriously injured, and may be even killed, by the galls produced by the larvæ in their borings.

The adult female probably deposits her egg between the thorns or in the axils of the tender side branches of the current season's growth. When the larvæ hatch they bore down into the tender tissues, and their activities cause, in a majority of cases, a gall-like swelling of the stem, which sometimes kills that portion beyond it. These galls vary in length from one to three inches, and also considerably in diameter, depending somewhat on the size of the twig. The writer observed these swellings during the autumn of 1904, upon thrifty shoots measuring half an inch in diameter, the galls increasing this to one inch. On June 10, 1904, quite a large amount of the work of these larvæ was observed near Logan, Ohio, and in every case the sawdust was ejected from a point in the axil of a small side branch. The twigs were very tender and watery and the larvæ about three-eights of an inch in length.

The larvæ continue to feed in the tender twige until they have reached maturity, about October 1, at which time they leave the gall through an opening which has heretofore served as an outlet for the sawdust. Descending to the ground they proceed to construct silken cocoons among the dried leaves. Sometimes they crawl under a leaf and fasten one side of the cocoon to it, the other being covered with grains of sand. The adults appear about October 20.

The larva when full grown is about half an inch in length, and reddish-brown in color; head light brown.' The pupa measures about two-fifths of an inch in length and is yellowish-brown in color. The forewings of the adult moth are a dark, ashy brown color, with a dull pinkish-white patch near the middle of which are several black spots; hindwings a little lighter than basal portion of forewings.

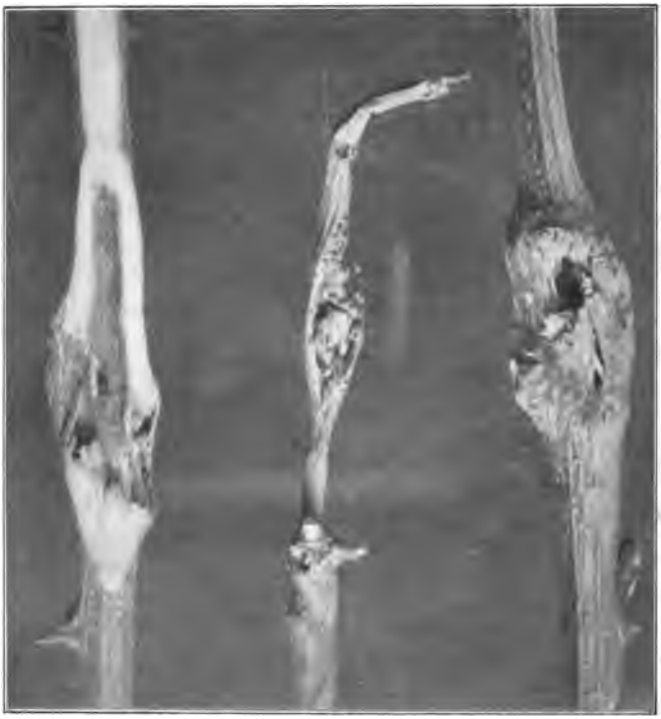

FIG. 8. Black locust twigs showing galls caused by larvae of the Locust Twig Borer (*Ecdytolopa insiticiana*). Natural size. (Original.)

REMEDIES.

The most effective remedy, and one that is not at all easy of accomplishment, is to cut off and burn infested twigs before October 1, thus destroying the larvæ within the twigs. Another suggestion that has been offered is to burn the fallen leaves while the insect is in the pupa state. The latter method appeals to many more strongly than the former, because of its ease of application, but it is open to the objection that it destroys the natural winter protection to the soil, and is not as sure as cutting and burning the infested twigs.

THE RED LEGGED FLEA BEETLE.

Crepidodera rufipes Lin.

This insect was first described by Linneaus, in 1758, as one of the numerous Coleoptera common to both Europe and America. On the former continent, it is widely distributed, except in the Arctic regions. In North America it is known to occur in New York, Pennsylvania, Maryland, Virginia and the District of Columbia, and in the National Museum are two specimens labeled "Texas."

According to Dr. Horn it extend as far west as Iowa. During the summer of 1904 it was noted as being very abundant in Ohio, and Mr. O. H. Swezey found this beetle doing serious damage to young peach trees in Adams county. Early in April of that year the adults swarmed out and ate the unopened leaf and fruit buds of the newly set peach trees. The greatest damage was on the part of the orchard adjoining a growth of locust sprouts, the remnant of a large thicket, the most of which had been destroyed to make room for fruit trees. This case was similar to that recorded by Dr. Riley (Insect Life, 5 : 333-42).

According to Mr. Schwartz, the insect passes the winter in the imago state among the leaves and rubbish in the locust groves, as he actually found a few individuals in such a location.

The writer found two adults at Leesburg, Ohio, on April 3, 1905. They were in the fine leaf mold, just at the surface of the soil and below the coarser material, which was about two inches deep. In the case reported by Mr. Swezey, the leaves and rubbish in the locust thicket were burned, in a ground fire, during the latter part of March, and as the insects were very numerous soon after this, it would seem that they must pass the winter in the damp leaf mold instead of in the leaves and other coarser material.

The favorite food plant is the black locust, but they have been reported as feeding upon several other trees, as the cherry, peach, pear, plum, apple and also upon the grape vine. In the case of cultivated trees the chief injury consists of eating the unopened leaf buds, while on the black locust, in addition to this, they eat round holes in the leaves after they have expanded. Very little is known as to the food habits of the larvæ, but, judging from analogy to other closely related species of the same genus, it is probably a root feeder, and as the imago feeds upon the black locust it is supposed that the larvæ also has the same host.

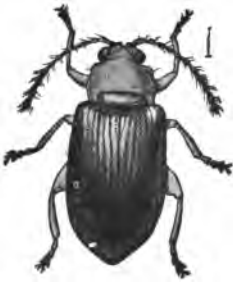

FIG. 9. Adult of the Red Legged Flea Beetle (*Crepidodera rufipes*) (from Riley and Howard, Insect Life, 5:341, 1893).

The adult is a pretty little beetle, about one-eighth of an inch in length by about half as wide; head, thorax and legs a reddish-brown, while the wing covers are a shining metallic blue, marked with parallel rows of fine punctures; abdomen dark brown. The hind pair of legs is especially adapted to a jumping habit, hence its name. Upon the slightest disturbance the insect suddenly springs into the air, but when placed upon a table, or other level surface they seldom jump more than ten or twelve inches.

REMEDIES.

This insect may be destroyed by the use of arsenical poisons, when feeding upon the foliage, but this becomes quite difficult when it attacks the unopened buds, because the beetle does not eat much of the tough outer bud scales. The habit is to eat a hole in the bud-covering large enough to admit the body, then hollow out the bud, eating the tender tissues back to the mature wood of the previous season's growth.

Their habit of jumping when disturbed would suggest jarring them onto a cloth coated with some sticky substance, or one saturated with oil, when the attack small fruit trees, but would not be advisable for locust trees under forest conditions.

THE LOCUST BUD WEEVIL.

Apion nigrum Hbst.

It has long been known that the adults of *A. nigrum* feed upon the black locust, eating holes in the leaves, and it has been supposed that the larvae, as the larvae of nearly related species, "develop within the seeds of the tree." (Insect Life, 5:338). However, the seeds of the black locust are but little larger than the adult curculio, so that this could hardly be true, and some observations made during the summer of 1904 disprove this suggesition.

At Marietta, May 22, 1904, the writer found the adults of *A. nigrum* working upon the unopened flower buds of the black locust trees near that city. On closer observation it was noted that the females were puncturing the buds and ovipositing in the holes thus made. On a second visit to this locality, on May 26, the insects were as numerous as before, and it was noted that many of the buds had ceased to develop and were falling to the ground, where they remained fresh for some time. An examination showed that nearly all of the prematurely falling buds had been punctured in one or more places, and upon opening them all stages of the insect were found, i. e., eggs, larvae, pupae and adults. Usually only one stage of the insect was found in a single bud, and normally but one larvae develops in a given bud, yet there may be two or more. From some of these buds the adults had emerged by eating a round hole, generally through the base of the bud, but some ate their way out at about two-thirds of the distance to the tip.

One raceme, upon which twelve adults were observed feeding and ovipositing, was found to contain thirty buds, twenty-five of which had been punctured in sixty-three places. The highest number of punctures in any one bud was seven. From thirty of these wounds a viscid, gummy substance was exuding. About fifty stung buds were collected from the ground and placed in a glass jar on May 26, and on June 5 twenty adult curculios, one pupa and four larvae were taken out, and on June 11 seven more adults were removed. Specimens reared in this jar were identified as *A. nigrum* by Dr. A. D. Hopkins, of the United States Bureau of Entomology.

The trees were again visited on September 18 and although they had been full of bloom in May, diligent searching failed to reveal a single seed pod that had matured, so thorough had been the work of the insects.

A female was observed ovipositing in the unopened buds of the black locust at Columbus, Ohio, May 15, 1905, and on May 27 several fallen buds were collected, each of which contained a small larva of this insect. In each of these buds the larva had eaten through the walls of the ovulary, thus effectually preventing fertilization, even if the bud should develop, which it did not do.

At McArthur, Vinton county, the curculios were not as plentiful as at Marietta, but one or two were found on nearly every black locust tree. On June 2 a female was observed busily engaged in drilling a hole in the gall-like, rolled up edge of a locust leaf, probably produced by the yellow locust midge (*Cecidomyia robiniae*), and after a little waiting the writer was rewarded by witnessing the oviposition of an egg in the hole thus made. This leaf was collected and preserved, but the egg failed to hatch.

Mr. O. H. Swezey reports having found the nearly full grown larvae of this beetle in similarly rolled up leaves of the black locust at East Cleveland, and further says "they were in a sort of cocoon," which was not the case with those developing in the locust buds at Marietta. He collected a few leaves containing the larvae, and "on July 6 two adult beetles appeared." It is hardly probable that this was a second brood of this insect, because the seasonal difference between the Southern and Northern portions of the state should account for about one-half of the month's time between the appearance of the adults at Marietta and East Cleveland. The other two weeks may easily be accounted for in the straggling of the brood, which is often noticed even in insects that appear distinctly in broods.

This curculio occupies a position between those, the larvae of which feed wholly upon the leaves, and those which develop in the seeds. This adaptation to a bud feeding larva is peculiar in that it shows a very remarkable acceleration in the larval development, and one that is somewhat unusual. The entire development, from egg to adult, must be accomplished within three weeks and possibly in a shorter time. This may mean a corresponding long life period for the adult insects, as they may be found at any time from early in May until the middle of September, and must pass the winter in this stage. An adult was found at Leesburg, Ohio, April 3, 1905, in an old gall formed by the locust twig borer (*Ecdytolopha infiticiama*). It is not known if the insect had passed the winter there or had simply sought this place as a temporary refuge.

Larva: The larva is a small white, footless grub, about one-fifth inch in length as it lies in a curved position in the bud; head about one-third of the diameter of the body, brownish in color, with a few scattered spines or hairs; body thick, tapering abruptly to a blunt point at the posterior end; a few scattered hairs on the three thoracic segments.

Pupa: White or yellowish-white, one-fourth inch long, slenderer than the larva, head slightly darker in color than body and with ten spines on top and front; proboscis folded along under side of body; two pairs of spines on dorsal side of the third thoracic segment, and two spines on posterior end of abdomen also one at the end of the femur of each leg.

REMEDIES.

As this curculio feeds during the larval and pupal stages entirely within the unopened buds, it is impossible to reach it with insecticides, but as the adults feed upon the foliage throughout the whole summer, it becomes possible to poison them at that time. Although the insect is quite common throughout the state, it seldom becomes numerous enough, except in restricted localities, to do serious damage.

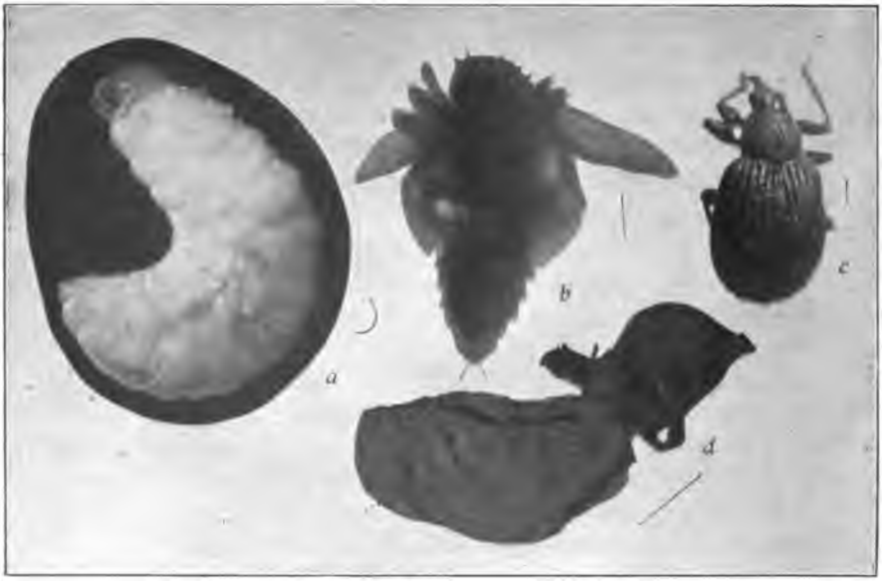

FIG. 10. The Locust Bud Weevil (*Apion nigrum*): a, larva; b, pupa; c, adult; d, black locust bud showing opening through which the adult beetle emerged. (Original.)

UNIV. OF CALIFORNIA

THE YELLOW LOCUST MIDGE.

Cecidomyia robiniae Hald.

The gall-like thickenings on the edges of the black locust leaves produced by the larvae of this insect were very common in Ohio during the summer of 1904. Usually but one gall is produced on a single leaflet, but two or more may be found, and it is not unusual to find several leaflets of a leaf thus injured.

The injury is caused by the female depositing her eggs near the edge of the leaflet, which, on account of the irritation thus set up, folds inward on the under side and becomes thickened and succulent, changing to a pale yellowish-green color. From one to three very small white maggots, varied more or less with orange-yellow, develop within each of these cavities. The larvae, when mature, descend into the ground and transform to the pupa state, the adults appearing in about ten days.

"The midge which develops from the larva is a pale orange color, with the sides of its thorax and often three oval stripes on the back and wings, dusky; antennae blackish and of fourteen joints in the females, twenty-four in the males; its length .12 inch." (Fitch & Haldeman.)

The injury produced by this insect is most evident during July and August, but that the insect is present much earlier in the season is attested by the writer's finding two leaflets showing the characteristic thickened and rolled edges on May 15, 1905, at Colombus.

REMEDIES.

No remedy can be suggested that is at all practical, except on a very small scale. Where only one or two small trees are badly damaged by this insect, the injured leaflets may be picked off by hand and destroyed.

THE LOCUST SKIPPER.

Apargyreus tityrus Fabr. (Syn. *Endamus.*)

This butterfly is very active, and is commonly seen around black locust trees during May and June. The large white eggs are deposited singly under a small flap, cut from a leaflet and fastened by a few silk threads. As the larva grows, other leaflets are added until the whole leaf is drawn together. It remains in this shelter during the day, feeding upon the surrounding foliage at night. When full grown the larva is a light green worm about one and one-half inches long and about one-fourth inch in diameter at the middle, tapering sharply toward both ends. It has a large reddish-brown head, with two yellow spots on the face, giving it a very comical appearance.

There are probably two broods in Central Ohio, as quite a number of larvae were seen on June 22, 1905, some of which were nearly full grown. One was placed in a jar on that date and pupated July 1, emerging July 17. Many half-grown larvae were seen during September.

As these larvae are foliage feeders, they should be controlled by spraying with arsenical poisons. On a small scale, hand-picking would be cheap and effective.

THE LOCUST SAW FLY.

Pteronous trilineatus Norton.

In some portions of the United States this saw fly does considerable damage, but no serious results from its attacks have been recorded from Ohio.

The white, irregularly semi-ellipsoidal eggs are laid in a crescent-shaped slit on the under side of the leaf and generally away from the mid-rib. The larva hatches in a few days and immediately begins to feed upon the leaf from the under side, eating a hole in it. When the hole becomes large enough the larva works within the opening, and continues feeding until the leaf is destroyed. A single larva will consume several leaves before it reaches maturity.

The larva, when full grown, measures about two-fifths of an inch in length, green in color, has twenty legs and a brownish head. When mature it drops to the ground and spins a tough, oval, dark-brown cocoon. In this it remains several days before transforming to the pupa state. The adult emerges in about three weeks. It has a general dirty-yellow color, with black markings on the head and segments of the thorax and abdomen. The wings expand a trifle over half an inch.

In the vicinity of Washington, D. C., there are two or possibly three broods in a season. In Ohio there is probably but one, although a second brood may appear in the southern portion.

It is not known whether the winter is passed in the pupa or adult stage. In some breeding experiments, carried on by Professor Comstock, part of them issued in the fall and part remained in the pupa state until spring.

REMEDIES.

As the larvae of this insect are leaf-feeders and very voracious eaters, it follows that an arsenical poison should be effective against them, but here, as in all other cases where poisons are applied, to be most effective must be put on while the worms are very small.

The Two Marked Tree Hopper.

Enchenopa binotata Say.

This little tree hopper is very common in Ohio, and may be found at any time from the first week in May until the end of the season. Its favorite food plant is said to be the Hop tree (*Ptelea trifoliata*), but it has also been observed feeding upon the bittersweet, grape, butternut, white birch, red bud, black locust and on weeds.

The adult measures, when full grown, three-tenths of an inch in length, including the horn, and one-fifth of an inch without it. The general color is a rusty-brown, with two bright pale-yellow spots on the ridge of the back just at the base of the horn.

The small elongate, almost cylindrical, delicate green colored eggs are deposited, overlapping each other, in two parallel rows of six to twelve each, in a slit made in the bark of the twig, and a thick, sticky, viscid, white covering of stringy albuminous matter is placed over them by the female. This covering of the eggs has often been mistaken for insects, even by eminent entomologists, as it resembles very closely the frothy excretions of several members of the family Cercopidae. These masses measure about an eight of an inch in length by one-tenth in width, somewhat hemispherical in form, and the strings of albuminous material are arranged in ribs, those on the one side meeting and lapping slightly onto those from the other at the median line. These egg masses were observed on a black locust tree at Ontario, Ohio, September 3, 1904, the adults being quite numerous on the tree at that time. During the following winter they were also noted on the Ptelea. The young were first noticed at Columbus on the black locust on May 8, 1905, and shortly afterward in large numbers on the Ptelea.

The nymphs are gregarious in habit, clustering together at the base of the tender wings, where they remain stationary for hours at a time. When disturbed, however, they move very briskly, but it is claimed that they do not acquire the power to jump until after the third molt. Those observed measured about one millimeter in length; dark-brown color above, yellowish-brown below; the dorsal surface of abdomen covered with white tipped spines arranged in five longitudinal rows, one occupying the median line and two on either side. Until the third molt they lack the horn, which, in the adult, projects prominently above the head, giving them an appearance which some have likened to a bird.

REMEDIES.

As this insect secures its food by sucking the sap from the tender twigs and leaves, it follows that an arsenical poison will not injure them, but they are amenable to treatment with contact insecticides, among which the kerosene emulsion is perhaps the best. Many times, on small trees, where only a few of the smaller branches are infested, they may be cut away and burned during the winter, thus destroying the eggs.

MISCELLANEOUS ENEMIES.

The following insects have also been reported as feeding on the black locust. The name of each species is followed by a short note, in which is given the part of the tree affected and the authorities for the statements.

It is a principle, well known among economic entomologists, that the growing of single species of trees or plants in large blocks often results in a rapid increase in numbers of its insect enemies. This is well illustrated by Prof. L. Bruner (Bul. 14 and 4th Ann. Rept. Neb. Agri. Exp. Sta.), who reports several insects as destructive to the black locust on tree-claims in Nebraska. Many of these are quite common in Ohio, but have not been reported as feeding upon this tree.

Observations made in black locust plantations in Ohio show that several insects, usually considered of little economic importance, have caused serious injury.

Oecanthus niveus Harr. THE SNOWY TREE CRICKET. This is a very common insect in Ohio and feeds almost entirely upon tender annual plants. The greatest injury, however, is caused by the habit of the female depositing her eggs in a row in the small twigs of trees, and especially in the canes of raspberry plants. This weakens the twigs and causes them to break down.

Cicada septindecim Linn. THE SEVENTEEN YEAR LOCUST. This well known insect inflicts serious injury upon forest and fruit trees during the few weeks of its adult life. The injury is greater on young trees, because the wood is softer, and the female is able to oviposit in larger twigs than on old trees; and, while the injuries will eventually heal over, a weak, dead-centered branch always results.

The pupae issue from the ground in immense swarms during May and June, usually about the first of the latter month, and at once transform to the adult stage. Soon after the female deposits her eggs in the tender twigs of fruit and forest trees, and among the latter the locust comes in for its share. The eggs are placed in pairs in punctures made for the purpose. The punctures are arranged in rows, generally along the under or outer side of the twig.

The larvae hatch in about six weeks and drop to the ground, in which they live, sucking the sap from the roots of the trees and perhaps other vegetation. Nearly seventeen years are passed in the immature stages.

Little can be done in combatting this insect, except in an indirect manner. If trees are planted in an artificial plantation, care may be taken not to set any less than four or five years previous to a "locust year."

Cerasa bubalus Fabr. THE BUFFALO TREE HOPPER. This odd looking tree hopper is a very common insect, and has a wide range of food plants. While it probably does not feed upon the black locust, it sometimes inflicts serious damage, especially on young trees. The greater part of the injury is done by the adults, as the nymphs feed very largely upon the more succulent annual vegetation, seldom feeding at the expense of trees except on the more tender sap sprouts.

The most grievous injury to the trees is that occasioned by the female in her peculiar method of oviposition. The eggs are laid in slits made in the bark of small twigs, and even in the stems of the smaller trees. These slits are usually on the upper side of the twigs, and the south side seems to be preferred to the north. The openings are about three-sixteenths of an inch long, curved or crescent shaped, with the concave sides in, and about an eighth of an inch apart.

The eggs, from six to twelve in each slit, are placed side by side in the cambium layer or in the inner bark, and the strip or core between the openings is severed from the sap wood, so that it dies. This is probably done in order to prevent the crushing of the eggs that would naturally follow a continuation of the growth of the whole twig. Each female produces from one hundred to two hundred eggs, but the period of oviposition is quite prolonged, beginning about the middle of August and continuing until frost kills the adult. In the Province of Quebec some females were observed depositing eggs as late as the end of October. The eggs remain dormant in the twigs over winter, hatching in May or June of the following season. Soon after hatching the young nymphs migrate to the more tender annual vegetation, where they live by sucking the juice from the stems.

Two parasites have been reported, both preying upon the eggs: *Trichogramma cerasarum* Ashm., and a small dipterous egg parasite reared by Mr. J. G. Jack.

REMEDIES.

The fact that this insect secures its food by sucking, bars the use of poisons, and contact insecticides are equally unavailing against the adults on account of their habit of jumping when disturbed. These latter solutions may, however, be used successfully against the nymphs. The best remedy for nursery and orchard conditions is clean culture, keeping down all annual plants upon which the nymphs would feed, thus starving them to death. Of course, this remedy would not apply to natural forests or forest plantations where no cultivation is practiced; but in these cases the weeds and grass may be sprayed about July 1, if it appears necessary, at which time the larvae are most numerous, with kerosene emulsion or some other contact insecticide.

Acutalis calva Say. Feeding on sap of black locust. 1904, reported by Prof. H. Osborn.

Ophiderma salamandra Fairm. "Feeding on sap from tender twigs."

Thelia bimaculata Fabr. Sucking sap from tender twigs. Quite common on black locust trees near Columbus, Ohio.

Thelia acuminata Fabr. Sap feeder.

Vandusea arquata Say. Feeding on sap of black locust. 1904, reported by Prof H. Osborn.

Aspidiotus perniciosus Comst. THE SAN JOSE SCALE. This scale insect, although of quite recent introduction, has a wide range of food plants, feeding upon a large number of woody plants, among which is the black locust. While the writer has observed this pest on locust trees and sprouts at several points in the state, no instance is known where it had done serious injury to this host. This tree seems to be one of the many species upon which the San Jose scale is able to live and even to reproduce itself, and yet never become numerous enough to inflict serious damage. It is only on those locust trees and sprouts which are growing near badly infested fruit trees that this scale is likely to be found. It is more commonly found on the locusts along ravines and on vacant lots in cities or in artificial plantations.

NATURAL ENEMIES.

This pest is believed to be a native of Northern China, and as it is not serious in that country an effort was made to find its natural enemies. The explorations of Mr. C. L. Marlatt, of the United States Bureau of Entomology, resulted in the finding of a lady beetle (*Chilocorus similis*) which feeds upon the San Jose scale. This beetle was imported into the United States, but has not proven a success. A colony was established in Ohio by this Division, but became extinct within a year.

Two of our common lady beetles feed quite freely upon this scale insect, both in their adult and larval states: *Pentilia misella* and *Chilocorus bivulnerus*. *Collops quadrimaculatus* has been observed feeding upon the same host, as has also *Scymnus lophanthae*. Two chalcids have been reared from this host: *Aphelinus fuscepennis* How. and *A. mytilaspidis* (Le B.) Valuable as is the work of these natural enemies, none of them are present in sufficient numbers to be of any importance in the control of this pest. Their efforts must, in all cases, be supplemented by direct measures.

A large number of contact insecticides have been tried upon this insect, of which the lime and sulphur wash has given the best satisfaction under orchard and park conditions. With small trees, as in nursery stock that may be dug and packed into small pace, the fumigation method is the best.

Aspidiotus forbesi Johnson. FORBES SCALE. "Occurs on peach, plum, apple, pear, *Robiniae pseudacacia* and climbing Jasmine."

Aspidiotus rapax Comst. THE GREEDY SCALE. Sucking the sap from the trunk and large branches of the black locust and a large number of other trees.

Aspidiotus juglans-regiae Comst. THE ENGLISH WALNUT SCALE. Infests the twigs of black locust.

Chionaspis gleditsiae Sanders. 1905, collected by writer on black locust twigs on Ohio State University campus.

Pulvinaria innumerabilis Rathv. THE COTTON MAPLE SCALE. While the favorite food plant of this common scale insect is the silver maple (*Acer saccharinum*), it is found upon a large number of species of trees, among which is the black locust. On this latter tree it seldom assumes a serious aspect, as the individuals are so few in number and are quite often parasitized.

Until nearly full grown they resemble very closely the Lecaniums, but when the female reaches maturity and begins to lay eggs, from May until July, one end of the scale is raised by the mass of waxy, filamentous material, in which the eggs are deposited. Not only is the scale raised, but this material is pushed out, forming a white, fluffy mass, about twice the size of the scale itself. According to different authorities each female lays from three hundred to one thousand eggs, after which she dies; but the scale remains upon the twig sometimes for a year, fastened there by the mass of fibrous material.

This scale insect enjoys the distinction of serving as the host for a lepidopterous parasite: *Laetilia coccidivora* Comst. The adult moth deposits its eggs in the cottony masses where her larvae develop. After the contents of one egg mass is devoured, the larva moves to another, and, if the twigs are badly infested, it constructs a silken tunnel from one mass to another, often destroying several egg masses before reaching maturity. Four lady beetles have been observed feeding upon this species, the twice stabbed lady beetle (*Chilocorus bivulnerus*), *Hyperaspis signata* Oliv., H. *bigeminata* Rand. and the imported species *Rhizobius ventralis*.

The following chalcid flies have been reared from the cottony maple scale: *Coccophagus lecanii* Fitch, *C. flavoscutellum*

Ashm., *Euntons lividus* Ashm., *Aphycus pulvinariae* How. and *Comys fusca* How.

A dipterous parasite, *Leucopis nigricornis* Egger., was reared from the cottony maple scale by Mr. J. G. Sanders. These natural enemies generally serve to hold the pest in check to such an extent that it does not do serious damage, except in extremely favorable seasons.

Icerya purchasi Mask. THE COTTONY CUSHION SCALE. Feeds upon the sap of various trees and shrubs. At one time threatened to destroy the fruit industry of California; now successfully controlled by the Australian lady beetle (*Vedalia cardinalis*).

Pseudococcus aceris Geof. "On black locust and soft maple."

Lecancum hesperidum Linn. THE SOFT BROWN SCALE. On black locust twigs.

Eulecaneum robiniae Towns. "On *Robiniae pseudacacia.*"

Eulecaneum robiniarum Dougl. "On *Robiniae pseudacacia.*'

Eulecaneum vini Bouche. "On *Robiniae pseudacacia.*"

Thridopteryx ephemeraformis Haw. THE BAG WORM. Feeds upon the foliage of a large number of trees, among which is the black locust. It has been reported as feeding upon this tree in Kentucky and Virginia, and infested black locusts were observed during the summer of 1905 at Cincinnati and Columbus, Ohio.

Thridopteryx sp. A species of bag worm was reported defoliating the black locusts in Arizona by Mr. J. W. Toumey, and was thought by him to be a different species from *T. epheraformis* which is so common in the east.

Zeuzera pyrina Linn. THE WOOD LEOPARD MOTH. A large European moth which had been introduced into the vicinity of New York City. The larva makes a large burrow in the main branches of quite a number of forest trees, and has caused a large amount of damage to shade trees in Central Park. It belongs in the same family with the locust Carpenter Moth, and, like that species, preys upon the black locust. No satisfactory remedy is known.

Tortrix sulfureana Clem. THE SULFUR LEAF ROLLER. The larva draws two or more leaflets together to form a tube, in which it lives, and from which it issues to eat the surrounding foliage. Very common on black locust trees in Ohio.

Tortrix rosaceana Harr. A leaf feeder.

Gracillaria lepedizaefoliella Clem. Larva mining the leaves of the black locust, making a pale yellow blotch mine on the upper surface. The mine is placed over the mid rib, and lateral galleries extend out on either side. The flattened pale-green larva pupates in the mine and later falls to the ground, where it finally emerges as a golden brown moth the following June. These mines were very numerous on black locust leaves near Perry, Ohio, during August and September, 1905. On many leaves every leaflet bore from one to five mines. No satisfactory remedy can be suggested for this insect.

Lithocolletis robiniella Clem. THE AUTUMNAL LEAF MINER. Mining the under side of the leaves late in September and early in October. Quite common in Ohio.

Lithocolletis ostensackenella Fitch. A leaf mining larva producing yellow blotch mines on the upper side of the leaflets.

Gelechia pseudacaciella Chamb. THE GREATER LOCUST LEAF GELECHIA. Feeding upon black locust leaves, spinning a slight web between two leaflets.

Recurvaria robiniella Fitch. THE LESSER LOCUST LEAF GELECHIA. The larva spins two black locust leaflets together and feeds between them, leaving the outer surface and larger ribs untouched.

Depressaria robiniella Pack. THE LOCUST DEPRESSARIA. Larva feeding on the flower buds and leaves, drawing the latter together with fine threads. Common in Ohio.

Chrysopeleia purpuriella Chamb. (Syn. *Acaca.*) Feeding upon the leaves.

Dasylophia anguina A. & S. "Larva feeds upon the leaves."

Schizura concinna A. & S. (Syn. *Oedamasia.*) THE RED HUMPED APPLE WORM. Larva feeds upon the foliage of quite a number of trees, among which is the black locust. Its favorite food plant is the apple.

Lycia cognitaria Gn. (Syn. *Amphidasys.*) Larva foliage feeder.

Cotocala vidua A. & S. Larva feeds upon foliage.

Papaipema nitelia Gn. (Syn. *Gortyna.*) THE POTATO STALK BORER. Larva boring in twigs of black locust, peach and several forest trees of which the maple is its favorite.

Acronycta americana Harr. (Syn. *Apatela.*) THE AMERICAN DAGGER MOTH. The larva of this moth feeds upon the black locust and several forest trees, of which the maple is its favorite.

Halisidota tesselata A. & S. THE TIGER MOTH. Larva feeds upon leaves of several forest trees, among which is the black locust.

Sabine stimulae Clem. (Syn. *Emperetia.*) THE SADDLE BACK CATTEPILLAR. The larva of this moth is easily recognized by a large green patch on its back, on which is a purplish-brown oval spot, from which it derives its name. It is a general feeder eating the leaves of a large number of trees and vines, but seems to prefer the Virginia Creeper.

Hemerocampa leucostigma S. & A. (Syn. *Notolopus.* THE WHITE MARKED TUSSOCK MOTH. The moths of this species emerge in the fall. The female is wingless and lays her eggs upon the cocoon from which she just issued, covering them with a white frothy mass. The cocoons are placed against a tree trunk or on a twig, and in the latter case are usually partly enclosed by a leaf. The eggs hatch in the spring and the larvæ feed singly. They are very prettily marked, and are the most beautiful of our caterpillars. The body is clothed with white hairs; the head and two glands near middle of back are bright vermillion red. A broad, velvety black strip extends along the back, with yellow stripe on either side; just below the spiracles is a second yellow stripe. A dense brush-like tuft of cream colored hairs is borne on each of the first four abdominal segments. The prothorax bears two plume-like pencils of black hairs, and a similar one projects backward from the eighth abdominal segment.

Both the larvæ and the pupæ are quite extensively parasitized, but direct measures are necessary to control this insect. The larvæ, being voracious foliage feeders, may be poisoned with an arsenical spray. The cocoons which remain on the trees over winter may be gathered, but should not be destroyed, because of the parasites they are likely to contain. They should be placed in a box away from vegetation, so that any newly hatched larvæ will starve, and yet allow the parasites to escape. On account of their rapid rate of increase, and the wide range of food plants, their control is becoming a serious problem in our city parks and streets.

Samia cecropia Linn. THE CECROPIA MOTH. The Cecropia is the largest of our Giant Silk worms, the adults often measuring six and one-half inches across the expanded wings. The full grown larva measures from three to four inches in length and about three-fourths of an inch in diameter, and is a dull bluish-green in color. It is a voracious feeder, and because of its large size does not require a very long time to entirely strip a small tree. The favorite food plant is the apple tree, and considerable injury was caused to stock in Ohio nurseries during 1905. Prof Bruner reports it as a pest on black locust trees in forest plantations in Nebraska. It is best destroyed by hand-picking the worms during the summer, or gathering and destroying the cocoons which remain on the trees over winter.

Antherea polyphemus Linn. (Syn. *Telea.*) THE AMERICAN SILK WORM. This is another of the Giant Silk Worms, but not quite as large as the Cecropia. The larva measures about three inches in length when full grown, is light green in color, with an oblique yellow line on each side of each abdominal segment, except the first and last. The back is ornamented with small, orange colored tubercles. The cocoon is shorter and rounder than that of the Cecropia, and is usually enclosed in a leaf. The same methods of control may be used in this as in the preceding species.

Porthetria dispar Linn. (Syn. *Ocneria*). (THE GYPSY MOTH. This is an introduced species which has established itself in eastern Massachusetts, southern New Hampshire and Rhode

Island, and is slowly but surely spreading. The female, although winged, is so heavy that she cannot fly; hence its spread is very slow. The state of Massachusetts has spent an immense amount of money in trying to control this pest. The insect has not reached this state, but its introduction seems only a question of time, and its wide list of food plants and voracious appetite would make it a serious enemy of our fruit and forest trees.

Espantheria deflorata Fab. Larva feeds on leaves.

Hypantria cunea Hub. The Fall Web Worm. This insect passes the winter in the pupa stage, the snow white moth emerging in May or June, and soon after the eggs are deposited in a cluster on a leaf. The larvæ are gregarious, feeding in colonies within a large, ugly web which they construct over all the foliage on which they feed. These webs were especially numerous in eastern Ohio during the fall of 1905, many trees having from forty to fifty each. The larvæ feed upon the foliage of a large number of fruit and forest trees, among which is the black locust, but preference is generally shown for the wild cherry (*Prunus serotina*). In the above mentioned region the black walnut suffered the most, with the wild cherry a close second. Cutting and burning the webs is the best remedy.

Melacosoma disstria Huhn. (Syn. *Clisiocampa*). The Forest Tent Catapillar. Larvæ very general feeders, eating the foliage from a large number of species of deciduous trees, including the black locust. They are gregarious, assembling in colonies on the trunks or large branches of the trees. An arsenical poison should be effective against them.

Automeris io Fabr. (Syn. *Hyphercheria.*) The Io Moth. The large green larva of this moth is a somewhat omniverous feeder devouring the leaves of a large number of forest trees and shrubs.

Memythurs robiniae. Hy Edwards. (Syn. *Sciapteron.*) Larva bores in the trunk of black locust trees, also the downy poplar in California.

Euproctis chrysorrhoae Linn. The Brown Tail Moth. A European pest accidentally introduced into Massachusetts about 1890, from which it has spread northeastward into southern New Hampshire, and local outbreaks have been reported from Maine and New Brunswick. The adults emerge during the early part of July, and soon after the female deposits her eggs in a mass from two hundred to four hundred in number on the under side of the leaves on the outside of the trees, usually near the top. The larvæ hatch in from fifteen to twenty days and feed until cold weather, when they retire to a closely spun winter web. They begin feeding with the return of spring, eating the opening buds. After the last larval molt the body is covered with minute, easily deatched barbed hairs, which cause an intense burning sensation wherever they come in contact with the human skin. Cutting and burning the webs and spraying with arsenical poisons, are the most effective measures of control.

Salebria contatella Grote. (Syn. *Pempelia*). THE LOCUST LEAS ROLLER. The larva draws the leaflets together to form a shelter for protection when not feeding upon the foliage.

Ectropis crepuscularia Tr. (Syn. *Cymatophora.*) Larva feeds upon foliage.

Dasyneura pseudacacia Fitch. Larvæ forming galls upon leaves.

Sacium lunatum Lec. Reared from black locust twigs.

Ino reclusa Lec. Reared from black locust twigs.

Lathropus vernalis Lec. Reared from black locust twigs.

Laemophloeus adustus Lec. Reared from black locust twigs.

Laemophloeus modestus Say. Reared from black locust twigs.

Hololepta fossularis Say. "Under bark of dead and dying poplar, hickory and locust trees."

Amphicrossus ciliatus Oliv. Reared from black locust twigs.

Cryptarcha ampla Er. "Found with *Cyllene robiniae* larvæ under bark of living yellow locust tree."

Ips fasciatus Oliv. "Found with *Cyllene robinae* larvæ under bark of living yellow locust tree."

Soronia undulata Say. Reared from black locust twigs.

Tenebrioidae corticalis Melsh. (Syn. *Trogosita.*) Reared from locust twigs.

Agrilus egenus Gory. Larvæ boring under bark; adults feeding upon the leaves. This beetle is quite common on black locust leaves in early summer.

Agrilus otiosus Say. "Adult feeding upon newly opened foliage."

Agrilus impexus Horn. "Occurs on the two locusts (*Gleditsia triacanthos* and *Robininae pseudacacia*), July and August."

Lyctus striatus Melsh. THE POWDER POST BEETLE. Infests the dry seasoned wood of several hardwood trees, including the black locust. These insects are able to live several generations in thoroughly seasoned wood and tunnel it in all directions; hence do a great deal of damage.

Petalium bistriatum Say. Reared from black locust twigs.

Synoxylon dinoderoides Horn. Reared from black locust twigs.

Macrodactylus subspinosus Fahr. THE ROSE CHAFER. The larvæ of this beetle feed upon the roots of plants, emerging during June or July. They are very difficult to control, as all of the adults do not appear at the same time, making it necessary to apply treatment at frequent intervals. Their favorite food plant is the rose, but they sometimes eat the blossoms of the grape, destroying the whole crop. The beetles are fond of all sorts of cultivated fruits, and also feed upon the foliage of a large number of trees, among which is the black locust.

Euphoria inda Linn. (Syn. *Cetonia.*) THE BUMBLE FLOWER BEETLE. Adults appear in early spring. Feed upon the sap from black locust and other trees, also upon fruit and vegetables. Quite common.

Lacnosterna sp. THE COMMON WHITE GRUB. The larvæ caused considerable injury to black locust seedling in the nursery row near Troy, Ohio, during 1905, the grubs cutting the tap root about one inch below the surface of the ground.

Ecyrus dasycerus Say. Reared from black locust twigs.

Crytinus pygmaeus Hald. Reared from black locust twigs.

Leptostylus sexguttata Say. Reared from black locust twigs.

Liopus alpha Say. "Infests yellow locust twigs on dead trees."

Liopus cinereus Lec. Reared from twigs of black locust.

Liopus facicularis Horn. Reared from black locust twigs.

Neoclytus erythrocephalus Fabr. Larvæ infest several species of trees, including the black locust.

Elaphidion villosum Fabr. THE OAK PRUNER. The larva infests the twigs of several species of trees, including the black locust, but prefer the oak and apple. They construct their tunnels in the center of the twig, working toward the body of the tree. At maturnity they nearly sever the twig from the inside, then retire up their burrows, plugging the opening with chips. These twigs are easily broken off by the wind, falling to the ground, where the adults emerge the following spring. The only known remedy is to gather and burn the fallen twigs with the pupæ in them.

Anomoae laticlava Forst. Feeds on foliage.

Cerotomia caminae Fabr. "Feeding upon sap from wounds made by *Cyllene robinae* in black locust."

Odontota nervosa Panz. THE ROSY HISPA. Feeding upon leaves of black locust, generally found with *O. dorsalis*. Common in Ohio.

Typophorus canellus Fabr. (Syn. *Paria.*) Feeding on leaves.

Mycetochares haldemani Lec. Reared from black locust twigs.

Epicauta unicolor Kirby. (Syn. *Macrobasis.*) THE ASHY-GRAY BLISTER-BEETLE. Thiscommon blister-beetle feeds upon a variety of trees and plants, including the black locust.

Polocamus hispidulus Lec. Reared from black locust twigs.

Zaglyptus striatus Lec. Reared from black locust twigs.

Apion rostrum Say. SAY'S WEEVIL. Adults feed upon black locust leaves, larva developing in seeds of the wild indigo bush, *Baptista tinctora.*

Eusphyrus walshii Lec. Developing in twigs of black locust.

Hypothenemus erüditus Westw. Reared from black locust twigs.

Micrasis rudis Lec. Reared from black locust twigs.

K. L. EMULSIONS.

(Delaware Experiment Station, Bulletin 73.)

The "Limeoid" or K. L. spraying mixture has been attracting considerable attention during the past season and seems to be increasing in popular favor as an effective remedy for the San Jose scale and a number of the fungus diseases commonly found in the orchard. The K. L. mixture or emulsion is made by pouring the kerosene and lime into a barrel and stirring well together with a paddle. Add ten or twenty gallons of water and stir to loosen the kerosene and lime from the bottom and sides of the barrel. Pour in water until the barrel is at least three-fourths full and with a hoe or dasher churn and pound the mixture for five or ten minutes to emulsify it. Then fill up the barrel with water and spray. A canvas or a board cover with a hole in it for the handle of the dasher will prevent the emulsion from splashing out.

Prepared hydrated lime or good stone lime, dry slaked are best for K. L. If the lime is fresh four pounds per gallon of kerosene will be ample, but if old more will be required. Use enough lime to take up all the kerosene and mix into a thin, sloppy mass. If drops of kerosene gather on top in less than a minute sprinkle on more lime.

In making the K. L. mixture the following proportions are recommended by the Delaware station:

For 10 per cent. K. L. use 5 gallons of kerosene, 20 pounds lime, 44½ gallons water.

For 12½ per cent. K. L. use 6¼ gallons kerosene, 25 pounds lime, 43 gallons water.

For 15 per cent. K. L. use 7½ gallons kerosene, 30 pounds line, 41½ gallons water.

For 17 per cent. K. L. use 8¾ gallons kerosene, 35 pounds lime, 40 gallons water.

For 20 per cent. K. L. use 10 gallons kerosene, 40 pounds lime, 38½ gallons water.

For 25 per cent. K. L. use 12½ gallons kerosene, 50 pounds lime, 34½ gallons water.

For 30 per cent. K. L. use 15 gallons kerosene, 60 pounds lime, 30½ gallons water.

The weaker solutions are used on the stone fruits and for summer spraying, while the stronger solutions are used on the pomaceous fruits and dormant trees.

Spraying for the scale in the fall of the year is recommended as at that time the insect has not glued their scaley covering to the bark and the remedy reaches the tender body underneath very easily. This should be followed by a thorough spraying in the late spring.

The K. L. B. solution is K. L. to which bordeaux (4-4-50 formula) has been added. The K. L. B. is prepared in exactly the same way as K. L. except bordeaux is added instead of water. The addition of bordeaux detracts nothing from the insecticidal value of the mixture and greatly increases its value as a fungicide thus accomplishing both purposes with the same application.

The K. L. B. P. solution is K. L. to which bordeaux and poison have been added. One pound of paris green added to about 75 gallons of bordeaux is about the right proportion. This mixture kills both sucking and biting insects as well as fungus diseases.

The K. L. S. mixture is K. L. to which sulphide of lime has been added. Sulphide of lime is made by boiling one pound each of lime and sulphur in one gallon of water for 45 minutes. The amount of this mixture to use varies with the season. When sprayed upon foliage an amount equal to one-half the amount of kerosene should be used. When the plants are dormant equal amounts of the sulphide and kerosene may be used.

Experiments seem to indicate that the K. L. mixture is as effective a remedy for the scale, to say the least, as the lime, sulphur, salt wash and can be made and applied much more easily and cheaply. The mixture and its modifications are well worth a trial.

A TRIP THROUGH EAST TEXAS.

V. H. DAVIS.

Through the courtesy of the "Cotton Belt" railroad, a trip over their lines was made a possibility during the last two weeks of June. This road runs through a section of Texas in which fruit raising (chiefly peaches) and truck gardening has come to be an important business within the last few years. The number of car loads of fruit and vegetables shipped to the northern markets has increased by leaps and bounds until at present the total is enormous, and the business seems to be only in its infancy. Thousands of acres of land are yet to be had within reach of transportation facilities, as well adapted to the business as any now devoted to it. The railroads are doing everything in their power to induce people from the north to settle here and take up this business, and are also doing everything possible to transport the crops to market with dispatch and satisfaction.

Our party consisted of some forty horticulturists from the agricultural colleges and experiment stations throughout the country, newspaper men and some practical men. We left St. Louis via special train on the evening of June 20, and arrived at Tyler, Texas in the heart of the fruit and trucking region, the following evening. The next morning the party went out to Morrill, a station some fifty miles from Tyler, named after Mr. Morrill, the moving spirit of the Morrill Orchard Company, that ownes some 12,500 acres of land at that place.. On account of the incessant rain it was impossible to inspect any other orchards carefully, consequently, I will describe very briefly the conditions as thev existed here and believe they will be found typical in most respects for the region.

Mr. Morrill is a Michigan man who has made a marked success with peaches in his native state, and his technical knowledge, together with his business ability, energy and foresight, are making an equally splendid success of the business in Texas.

The soil upon which peaches and vegetables are grown is sandy, on Mr. Morrill's farm light in color, while only a few miles north, at Jacksonville, it is red. Splendid orchards were growing on both types, and while the best orchard seen was on the light sand the difference was probably due more to the man in charge than to any difference in the soil. The unimproved land is almost invariably covered with a growth of scattering short-leaved pine or scrub oak, pine and musguite, and is cleared ready for the plow at a cost of $8 to $15 per acre. This unimproved land can be secured at from $10 to $25 per acre, depending on its proximity to the railroad. These soils all wash very easily and must be handled with considerable care. Many hundreds of acres are being cleared and set to peaches around Morril, aside from that belonging to the company. We were driven all forenoon through what was almost one continuous orchard, all belonging to neighbors of Mr. Morrill. In the afternoon we were driven some four miles, over almost impassible roads to one of Mr. Morrill's orchards, con-

Four Hundred and Fifty Acres, Elberta Orchard—Morrill Orchard Co.

sisting of 450 acres of Elberta peaches in one solid block. To be able to see this orchard was well worth the entire trip. It is probably the most perfect orchard in the United States. Craig of Cornell, Sandsten of Minnesota, and others in the party who had seen all the noted peach orchards in the country said it could not be compared with any they had ever seen before. This block of trees is located on a high tableland and in the center of the orchard there is a high mound from which the view in Plate I was taken. Perfectly clean cultivation was being practiced. The trees were three years old, about eight or ten feet high, with very low heads and the diameter of the tops about the same. Not a tree was missing and every one seemed to be a twin to its neighbor. No disease or insects were to be seen. The Elberta is the variety grown almost exclusively, and the climate seems to be peculiarly adapted to it. Trees are as large at three years there as at five here, and if the season is favorable they will usually bear profitable crops at the former age.

Two enemies quite severe in most other peach regions are not present as yet. These are the scale and yellows. They are bound to come sooner or later and will spread very rapidly on account of the large and continuous areas. The man who does not have the business well in hand and is not prepared to combat them successfully will find his dream of profits rapidly fading.

Tomatos, cantaloupes, sweet potatos and other crops in lesser quantities are grown between the trees during the first two or three years. The tomato is perhaps the most important and is invariably pruned and trained to a single stem supported by a stake. In this warm, sandy soil they mature very quickly and bring a good price on the northern markets, during the month of June when the bulk of the crop is harvested. The tomato blight is the most troublesome enemy, doing great damage some years and little others, depending on the nature of the season.

The cantaloupe is next in importance and is marketed largely in June and early July. In dry seasons they are of good

Tomato Field

Red Peppers

quality but on account of the wet weather the crop of 1905 was very poor.

Sweet potatos oftentimes follow tomatos or contaloupes, giving two crops from the same land during a single season. They are propogated by taking the runners from plants started early in the season and sticking them directly into the soil. If the soil is reasonably moist they will grow very quickly and make a good crop.

All fruits and vegetables are carefully sorted, graded and packed. This is absolutely necessary on account of the long distance to markets. Aside from this, however, it is good business. An immense packing and sorting house is located alongside of the railroad. Here the collecting wagons bring all the produce from the field for packing. A half dozen of these wagons may be unloading fruit to the packers on one side, and the packers loading as many cars on the other at one time.

Labor is a very important problem everywhere in the south. Negroes and Mexicans do practically all of the common labor. Whites are employed as foremen and white men and women do the sorting and packing generally. Negroes are employed entirely as common laborers on Mr. Morrill's place and provisions must be made for a small army of them. Negro quarters are maintained where comportable, but inexpensive houses are furnished the men and their families at a reasonable rent. Common laborers were receiving from $1.00 to $1.25 per day.

A branch of the Texas penitentiary is located on the farm of the company and convict labor is extensively used. The state houses, feeds and guards the convicts, hiring out their services to the farmers at about $25.00 per month. This is the most satisfactory labor that can be secured. Three gangs of about twenty convicts each were at work in one of the young orchards and the sight reminded one of what we had heard and read of slavery days. With each gang was an overseer or guard usually on horseback, a double-barrelled shotgun across the pommel of the saddle, and a pack of bloodhounds at the horses' feet. While this sort of thing shocked some of our

Cantaloupes and Peach Trees

Sweet Potatos Between Peach Trees

nothern sensibilities one does not have to be in the south many day to appreciate the fact that the conditions there are much different from those existing in the north.

It must be remembered that this entire business in this region is entirely dependent upon the railroads for transportation facilities to get their crops to market. So far the roads have done everything possible to encourage the growers and are spending hundreds of thousands of dollars in bettering their roadbeds and rolling stock in order to handle the increasing crops with increasing dispatch. The transportation of perishable fruits is not altogether one of rates, but speed is a very important item. It would require not less than two days to reach St. Louis, their closest large market by the fastest freight, and when you remember that Chicago, Indianapolis, Detroit, Cleveland, Columbus, Cincinnati, Washington, Baltimore, Pittsburg and other cities receive large quantities of this produce you will begin to realize how important is the transportation problem. These long distances mean large freight bills. It costs about $165 to send a car of fruit to Cincinnati and you can estimate what it would be to other cities. The growers' sole hope, then, is to reach the northern market before local produce appears, and in this manner secure a high price for his produce. In spite of this handicap large profits are usually realized by the careful grower and shipper. Mr. Morrill's peach crop for 1904 netted him 90 cents per bushel.

What are the opportunities for the man who wishes to grow fruit and vegetables in Texas? Splendid! Climate and soil are perfectly adapted to the growing of the crops mentioned, land is reasonable, and transportation facilities very good, but don't forget to consider the freight. In my opinion there are hundreds of localities in Ohio where fruit and vegetables can be grown with equal or greater net profit on account of the near proximity to good markets.

ANNUAL MEETING.

The annual meeting of the Society for 1905 was held in Horticultural Hall, Saturday, December 23. President Lazenby called the meeting to order at 2:30 p. m. and suggested that inasmuch as the publication of the quarterly had been dispensed with the minutes be read at each meeting.

Professor J. H. Lagemann, Chairman of the Committee on Botany, reported on "Shelter Thickets."

Professor Derby asked if the present Park Commission of the city was active and what they had accomplished. Professor Lazenby replied that the committee had been, and still was, quite active in their efforts to give Columbus more and better parks.

Professor Osborn reported for the Committee on Entomology. He said in part that the past year had not been marked by anything striking in the field of entomology. There were the usual number of insects.

The development of the relation of the mosquito to yellow fever was one of the most important pieces of entomological work during the year. It has been shown beyond a doubt that the mosquito is largely, if not entirely, responsible for the spread of this disease.

The ravages of the boll weavel still continues to hold the attention of the cotton growers. It has been pretty clearly demonstrated that the only relief lies in a resort to cultured methods rather than in any attempt at complete extermination.

The Gypsy moth again holds the center of the stage in the East. After fighting the insect for a number of years and spending millions of dollars the legislature of Massachusetts failed to make any appropriation for this work in 1904. The commission was re-established in 1905. The insect has appeared in several new localities and practically re-covered the entire district formerly supposed to have been freed from the pest. It seems only a matter of time when the insect will spread over the entire country.

Mr. A. F. Burgess, Nursery and Orchard Inspector for the State, spoke very briefly on the work of his department. He said in part that "the work of the department now covers several distinct lines. The demand for nursery inspection is very rapidly increasing. There were over one hundred more applications for inspection this year than last. This increase was due in large measure to the increased demands for small fruits. Nurserymen are doing more fumigating than ever before. One ounce of the cyanide to one hundred cubic feet of space is a safe quantity to use. The injury to stock attributed to fumigation has been largely due to careless handling which permitted the stock to dry out. Orchard inspection is done only upon the petition of the owners. The lime, sulphur, salt wash has given excellent satisfaction during the past year.

The kerosene-limoid mixture cannot be recommended for general treatment.

The Sphinx moth was found feeding on the catalpa in several places in the State last summer. It is reported to have defoliated the catalpas at Jackson for several years.

A new disease was found attacking the apple and cherry stock. It is in the nature of a blight.

Mr. Phelps, for the Committee on Vegetables, reported a larger crop of potatoes in the county than for several years, but that they were sprouting badly in ordinary storage. Professor Lazenby said that this latitude (42°) was about the southern limit of successful commercial potato growing, and also reported potatoes sprouting badly.

The report of the treasurer was read by Professor Lazenby and accepted by the Society. Messrs. Gill and Derby were appointed to audit the accounts of the treasurer and report to the Society.

Professor Derby moved that the President and Treasurer be made a committee to consider the reinvestment of the funds of the Society.

By vote of the Society the recommendation of the President regarding the Secretary, viz., that hereafter the Secretary be paid five dollars for each meeting and that the constitution and bylaws be changed in accordance with this recommendation, was adopted, and the President and Secretary made a committee to make the necessary changes in the constitution and by-laws and report to the Society.

Upon motion of Mr. Gill the Secretary was authorized to publish three hundred copies of the Procedings of the Society for 1905, bound in cloth.

The annual election resulted in the election of the following officers:

President, W. R. Lazenby; Vice-President, Herbert Osborn; Secretary, E. C. Cotton; Treasurer, George W. Sinks; Executive Committee, George W. Gill, J. Warren Smith, S. C. Derby.

Upon the recommendation of Mr. Davis, Mr. Cotton was unanimously elected to membership in the Society.

The President was authorized to secure suitable badges at the expense of the Society for the members of the State Horticultural Society attending their annual meeting January 10th to 12th inclusive, in Columbus.

A unanimous vote of thanks was tendered the officers of the past year and to Mr. Sinks. The Society adjourned to meet at the call of the Executive Committee.

SHELTER THICKETS.

BY PROF. J. H. LAGEMANN.

It is a very desirable thing to have fine parks with beautiful flower beds, green lawns, ornamental trees, fountains, lakes, etc., but people who have an ear and sense for sound and music and the bird life of forest and stream find something missing in our parks of the present day. It is chiefly the song birds with their sweet music. The many songsters of a few years ago have nearly all disappeared from our parks and now we see only an occasional woodpecker or a passing bluejay. Very seldom do we see the busy tomtit, the wren or the thrasher, but in their stead we see everywhere the parasitical sparrows and the much-petted, obnoxious squirrels. We may ask why are there so few singing birds in our costly parks and groves?

Our parks are artificial creations for the amusement and pleasure of the public and where there are many gaily dressed people and screeming boys and girls, singing birds have trouble in finding a congenial home. Wild animals have, and always will look upon human beings as enemies and will always avoid thickly-settled localities, and when possible will retire to more secluded places than our public parks when opportunity affords. Occasionally we may see some of the common songbirds in the tops of the high trees, but this is not their usual habitation.

One great fault with our parks is the lack of shelter thickets, screens and coppices as shelters for birds and perhaps other animals. How could such shelters be arranged and where placed? The most suitable places for such screens would be in least used corners of the grounds and around vaults, necessary buildings, etc. In front of these screens such plants as the caladium, canna, ornamental grasses, sunflowers, dahlias, etc., could be planted to advantage.

Behind these plants which are easily renewed each year should be placed a fence of wire netting some six feet high. This fence will last six or eight years, after which a hedge of osage, previously planted, will make another fence unnecessary except perhaps one only two or three feet high to keep out dogs.

The amount of space occupied by these shelters will vary with the amount of land available. A quarter of an acre along the least frequented streets, or an acre in some other suitable location will do a great amount of good. These enclosures should not be open to the public. Only the park attendants and those directly interested in the study of zoology, ornithology and botany should be admitted.

What may be planted in these enclosures? First, all our native shrubs, as forsythia, snowberry, lilac, ribes, hazel, roses, black and red haw, privet, ilex, viburnum, mulberry, sassafras, raspberry, blackberry and numerous others. These will keep the birds supplied with fruits and berries during their summer stay, and there will always be insects enough for all. In addition to deciduous trees there should be some evergreens for shelter during the winter.

Below and underneath the shrubbery native wild flowers will find a welcome retreat and shelter, where they will flourish, safe from the flower, root and bark hunters.

The questionable habit of eliminating all boundary lines between "mine and thine" and the removal of all hedges from around parks, not only removes the last sheltering place for our birds, but at the same time removes all barriers to the ingress of people and animals.

In these coppices then the birds will find the necessary quiet for the rearing of their young. From them they will go to all parts of the parks and return to them when danger threatens. Suitable nesting boxes should be provided, but everything ornate and impracticable should be avoided.

These shelter coppices will also prove last refuges for many of our rapidly disappearing wild flowers, and from the supply grown here many plants may be selected for planting in the ornamental beds elsewhere in the grounds.

When our ancestors planted Goodale and the city parks they had these ideal conditions in mind. In recent years, however, thousands of dollars of the city's taxes have been spent in making lakes that have no water, bath houses that are never used, intricate and useless walks and drives that not only mar the beauty of the grounds, but are in some cases actually dangerous, conservatories in which nothing is grown, and in various other ways that give no possible return either in way of beauty or utility.

Another mistake was made in removing all enclosures, hedges and fences from our parks. If either a public or private park is to remain in good order it must be surrounded by a fence of some kind and the public admitted during certain hours each day. Individuality and variety, the chief factors of beauty in nature, can best be preserved behind hedges or fences and with their restoration the usefulness of the parks would be greatly increased.

Shelter thickets should not only be kept up in the parks but upon the farms. There can always be found many suitable nooks and corners where little can be raised except shrubbery, which would afford protection to both birds and game. If large enough these plantings may have some effect on the waterholding power of the soil and increase the probability of springs.

Twenty-three years ago Dr. J. B. Schueller made a list of 101 different species of birds that visited his garden (187 feet long by 75 feet wide) on South High street during the spring and summer, and fifteen other species were noted as transient in the neighborhood. How many could be seen now, only twenty-three years later? Perhaps not more than one-fourth this number could be counted during any season at present. True, the increasing population and decreasing open places are largely responsible for the decreasing numbers, but the lack of shelters in the places yet available for them, and the thoughtlessness of many people both old and young are the conditions largely responsible for the decrease in the numbers and variety of birds, animals and flowers in what was formerly their natural haunts.

Let us hope the eyes of the people will be opened to see this important matter before it is too late and that plans will be adopted for the preservation and protection of these necessary features in our parks such as have already been adopted by many other cities. It would not be long until the beautiful wild flowers and the sweet songs of birds would be again seen and heard throughout our parks.

PRESIDENT LAZENBY'S REPORT AT ANNUAL MEETING.

I have prepared a short report of the work of our Society during the past year, together with a few historical statements and reflections.

First, as to membership: Twenty years ago (1886) our Society had 12 life and 47 annual members, making a total of 59. This year we have on our roll 19 life members and 56 annual members, a total of 75. This is not a large gain for twenty years of effort, but it shows that the Society is holding its own in membership at least.

Of the twelve life members of twenty years ago four are still living. Although the infirmities of age prevents their attendance upon our meetings we are still assured that they hold our Society in kindly remembrance. These four are William G. Deshler, J. M. Pugh, J. J. Janney and Mrs. J. H. Klippart. The first two named have been members of the Society for over fifty years, and the two latter for something like forty. I suggest that we send to each of these life members our good wishes as a Christmas greeting. Under our constitution any one may become a life member upon payment of $10.00, which shall be in lieu of all assessments or annual dues, and all persons who have been members for twenty years or more and have paid regular dues, shall be life members.

Through some oversight in our last annual report three members are listed in both the *life* and *active* membership roll.

One active member has passed away during the year, Mr. John P. Streeper. He was a faithful member and a genuine horticulturist. Some suitable recognition of his life and services should appear in our forthcoming annual report.

This year we departed from the long-established custom of holding annual meetings and have met four times only—once each in January, June and October and the present annual meeting in December. The June meeting was a fair success, and quite a large proportion of the membership came together to celebrate the sixtieth anniversary of the Society.

The October meeting at the hospitable home of Mr. F. P. Vergon of Delaware was not well attended, but all who were there spent an equally pleasant and profitable afternoon. It is perhaps too soon to speak definitely of the advantages or disadvantages of the new practice, or to compare it with the old method of monthly meetings. We can speak more confidently after another year's trial. The lessened number of meetings and the discontinuance of the quarterly journal have lightened the duties of the Secretary so that the salary is out of proportion to the work required. I suggest that hereafter the Secretary be paid five dollars for each meeting, and that our Constitution and By-Laws be changed in accordance with this recommendation.

As we have learned from the Treasurer's report the Society is in a good financial condition. We should bear in mind, however, that $5,000 of our invested funds, which up to the first of last July was bringing us an interest of 7 per cent., since that date is only yielding 4 per cent. I find upon consultation with Treasurer Sinks that he thinks it possible to safely reinvest the $5,000 at 5 per cent.

As we have uninvested funds amounting to $463.36, I suggest that we take $300 and add it to our permanent endowment. The balance will be sufficient to publish the proceedings of this year and meet all necessary current expenses. The lapse of time has pushed the Society well beyond the three score mark, in point of age, but unlike an individual there is no reason why our organization should grow old. If opportunity has been improved, obligations met, and duty fairly well discharged, the length of our existence should be a source of congratulation, with no room for regret. In order to keep up the interest and a fair degree of enthusiasm we should have a regular infusion of young blood. The older members may do what they can but we are apt to lose something of the elasticity of youth, and our duties are done in a more perfunctory way. I trust an earnest effort will be made the coming year to enlist the interest of those who can work with energy and enthusiasm.

FRUITS.

H. WARREN PHELPS.

In the early spring months there seemed to be good prospects for an abundant fruit crop. A few varieties of the apple bloomed very sparingly but most of them bloomed profusely. Excessive rainfall at the time of blooming destroyed many of the flowers and much of the fruit that did set dropped while immature. For these and various other causes the apple crop was very light. Very few farm homes in the county have apples for winter use.

There was a fair supply of peaches on many farms. Summer pears were a very poor crop, but the fall varieties were more abundant. Cherries were scare, but some of very excellent quality. The plum crop was very light, but grapes were abundant wherever the vines had been well cared for.

Currants, gooseberries and raspberries were plentiful in some localities where the plants had received proper attention. The strawberry crop was below the average throughout the country.

A large area of land in the northeastern and east central part of this county along the east side of the Big Walnut produces splendid crops of all kinds of fruit. These lands generally have not been set to fruit and on account of their not being adapted to the raising of grain can be secured at very low prices. Capital invested in these lands and the growing of fruit would yield much greater returns than the rich creek bottoms held at a much higher figure.

REPORT OF THE TREASURER.

(Year ending December 31, 1905.)

G. W. Sinks, Treasurer, in account with the Columbus Horticultural Society.

RECEIPTS.

1903	
December 17, to balance	$214 71
1904	
January 28, to dues	1 00
February 8, to interest C. & T. R'y bonds	175 00
May 9, to interest Free Turnpike bond	15 00
August 1, to interest C. & T. R'y bonds	175 00
1905	
February 3, to interest C. & T. R'y bonds	175 00
February 3, to interest U. S. 3% bonds	11 25
February 25, to dues	26 50
March 1, to interest Turnpike bonds	30 00
July 31, to interest C. & T. R'y bonds	175 00
August 31, to interest U. S. 3% bonds	15 00
December 16, to interest U. S. 3% bonds	6 75
December 20, to dues	16 50
December 20, to lunch	9 50
	$1,046 31
1905	
December 22, to balance	$493 73

DISBURSEMENTS.

1904	
January 16, paid Berlin Printing Co	$119 46
April 5, paid V. H. Davis, Secretary	20 80
July 17, paid V. H. Davis, Secretary	12 50
July 17, paid postage	84
July 17, paid Berlin Printing Co	136 36
October 6, paid V. H. Davis, Secretary	12 50
February 4, paid Berlin Printing Co	128 42
February 27, paid President Lazenby	20 50
March 3, paid V. H. Davis	16 50
March 6, paid Spahr & Glenn	10 25
June 19, paid V. H. Davis	37 85
July 31, paid express charges	1 25
October 5, paid Busy Bee	35 25
Balance	493 73
	$1,046 31

PERMANENT INVESTMENTS.

U. S. 3% bonds	$300 00
Franklin County 6% bonds	500 00
Columbus & Toledo R'y extended 4% bonds	5,000 00
Total	$5,800 00
December 23, account of V. H. Davis, Secretary, for six months' salary	$25 00
Incidentals	5 10
Not included in above	$30 10
Leaving actual balance on hand and in bank	$463 63

Respectfully submitted,
G. W. SINKS, Treasurer.

AGRICULTURE IN THE PUBLIC SCHOOLS.

BY C. W. BURKETT.

The prosperity of our country is largely dependent upon the success or the failure of our agricultural pursuits. How to keep boys and girls so much interested in country life that they may remain upon the farm in peace and contentment instead of drifting to the city is one of the problems that confront the social world today. Country life in the past has not developed and trained young men and women in an educational way. The boys and girls on the farm have seen mental possibilities in other pursuits, but from the nature of the work they have not connected agriculture with education and mental activity. When our boys and girls receive instruction in the elements of the art and science of agriculture, which many of them would naturally choose as a profession—when the tilling of the soil is ennobled and beautified by interesting illustrations and by practical demonstrations of farm subjects such as soil, plants and animals —then, and not until then, will they cease pouring into the cities and be content to remain on the farm and, in a country environment, to solve some of the problems that confront agriculture today. Moreover, this opening up of the thought that farming offers a chance for study and brainwork will give an added attraction to country life; hence it follows that we must teach agriculture in the schools. We readily see that if we teach arithmetic in the school, the child becomes interested in mathematics; if we teach history and language, the child becomes interested in these subjects. So with agriculture. Teach the child in school some of the fundamental truths about the soil, the plants and the animals and he will be eager to seek after new truths of larger importance and more extended use. The school is the place to gain fundamental knowledge; consequently if something is to be learned of agriculture, there is no better place than the school in which to teach it.

The country boy spends fourteen to eighteen years of his life studying a smattering of everything in the educational calendar, except the one industry, the special knowledge of which is to determine his success or failure in life.

This boy watches the corn plant from day to day as it grows to maturity, but he is altogether ignorant of the method of its growth. He can tell you the name of every Roman that ever spoke in the Roman Senate, but to save his life he cannot explain how the plant takes its food from the air and soil, carries it to the leaves and converts it into available plant food. He can relate to you in an interesting way the retreat of the Ten Thousand, but he cannot tell you how to stop the advance of the army of bugs across his father's potato patch. He is no blockhead; he can take a pencil and paper and draw a figure and prove any problem in geometry, but with all his book learning he cannot tell how the soil can be better tilled in order to conserve the moisture through the coming drought.

Agriculture should be taught as a cultural study. We will not further discuss the principle that agriculture should be taught school children because many of them are going to farm. The point is, that agriculture should be taught in all of our schools that the child may be brought into intimate touch with nature in all of her phases, so that the future man or woman, whatever occupation he or she may follow, may know something of this great industry upon which all trades and professions depend. The lawyer should know agriculture because many of his clients are farmers with agricultural problems.

There are ten cases concerning the plant, the animal, the soil and things pertaining to them, to one of constitutional or international law. Likewise the doctor will find that a knowledge of plant physiology or plant growth, of plant feeding or animal feeding, of milk, or of any of these practical farm subjects will be of constant help to him in his vocation. A good proportion of our ministers are in charge of rural congregations. Consequently the minister should know something of agricultural problems so that his discourses may have applications that his parishioners will understand and appreciate. Moreover, the man in the city who has a lawn or a garden, whatever his trade, business or profession is interested in all these practical agricultural subjects.

Agriculture in the schools will help the boys and girls who expect to be farmers. Nothing will dignify agriculture more than to give it a place in the school course. It will open up many an avenue of activity to the schoolboy. It will cause him to think about his work. It will suggest the necessity of using the brain as well as the muscle, thought and apprehension, as well as acres and teams and tools.

Then we should teach agriculture because agriculture pays. It affords an opportunity for earning a livelihood. In this practical age all enterprises must have a commercial value; and agriculture holds out good inducements to the educated man. Professor John Hamilton says that he once met a man owning a farm of 150 acres in a neighboring valley. It was well stocked and prosperous.

"I asked him if he would trade places with the blacksmith, the carpenter, the stone mason or the country merchant in the neighborhood; I asked him if he would change with the doctor or the preacher and he said no; neither would be exchange with any of the average lawyers."

Since agriculture is an occupation for so many people, affording opportunities in a financial way as well as in the home, bringing health and education and many comforts of life, it follows that the boys and girls should be taught something about such a science.

All this suggests that from the very nature of conditions we should teach agriculture in our public schools. It makes no difference how much we develop other industries—our railroads, our commerce, our cities—we can be sure that there will be thousands of our young men and women who each year will take up agriculture as a gainful occupation. Is it not wisdom, then, on the part of our educators, our teachers, our parents, to give these future farmers some instruction, some training along the line that they are to follow in life? You say: "We would do this if we could; it is not possible, because our teachers are not trained to teach agriculture." I believe if we wait until our teachers voluntarily train themselves to teach agriculture we shall wait until judgment day. If, on the other hand, we are agreed at the outset that the proper way to do a thing is to do it, and that the proper way to teach agriculture is to teach it, then very soon will our teachers prepare themselves just as they have for other studies, and they will teach agriculture just as successfully as they now teach any of the various subjects in the school course; nay, further than this, the average school teacher knows more about agriculture today than he or she does about many of the subjects that are being taught. The mere association with the soil, the plants, the animals, brings experience, and experience makes the good teacher. It is a good deal harder to get in touch with a Greek root than it is to get in touch with an alfalfa root; and the alfalfa root opens up an interesting and valuable line of thought that one would have to search a long time to find in the Greek dictionary. More than this, to teach some agriculture does not mean that one must know all agriculture. If you simply teach a few of the ordinary facts that will make life happier and sweeter and make the farm home better, that is a good beginning and one that will bear rich fruit. The average school teacher can do these things. He or she has already a better soul interpretation of some of the simple agricultural truths than may be found in grammar, physiology or other studies that are now being taught; and with a simple text-book it is not a difficult thing to get a class of young people to understand basal truths of agriculture. You should teach agriculture as you teach everything else in the schools. You ought to use a text-book. A good text-book, with an enthusiastic teacher back of it, will carry the subject. Then assign lessons and perform some agricultural exercises and experiment. Those of you who have been interested in nature study and who have been teaching it in the school will find no difficulty whatever in going a little deeper into the stream and drawing out larger pebbles for practical use.

You doubtless have heard some conservative teacher object to the study of agriculture on the ground that the school course is full and there is no reason for it. Dont you think you can make room for it? Let the spirit be there and a way will follow. There is little doubt that within the next hundred years the school course will have passed through such an evolution that the nineteenth century teacher will be unable to recognize it. If you are a teacher and stand for progress, you cannot say that there is no room for agriculture in the school; you will find that the course can be adjusted readily so as to include agriculture without crowding. If there is any crowding to be done, let us crowd out some of the things that are of less importance. Especially in the country school should this be brought about, for the country school is the farmers' school, and among the vast number of things that are being taught there is no good reason why the thing by which he is to get his bread and meat should not be included. There is room for it there; and if you wish to help the schools and the country people, you will do your best to place agriculture on the same footing as mathematics, or grammar, or history, or reading, because agriculture is the handmaid of civilization. Let us remember that we can never straighten the oak after it has been twisted and turned for years by the tempest. So, if we wish to train our children in the right principles and start them in the way they should go, we must begin while their minds are fresh and bright and teach them to love nature, the country, the home and the state.

INJURIES TO TREES BY MICE AND RABBITS.

This winter many orchard and other trees have suffered injury by rodents. In one instance, to which the attention of the Ohio Experiment Station has been called, every tree in a grove of 2000 catalpas, set out for two years, was completely girdled, some trees to a height of more than a foot, by the meadow mouse, *Microtcs pennsylvanicus.* Some of the trees had their main roots badly cut and injured, making their permanent recovery very doubtful. This grove was on low ground, bordered by grass and ditches, the surroundings furnishing exactly the environment most agreeable to this species; also the weeds and grass had been left among the trees, thereby not only furnishing concealment and nesting places for the mice, but means of ascent by which they were enabled to girdle the trees to so great a height.

Orchard trees, when girdled in this manner, are best remedied by bridge grafting. Less valuable trees, like catalpa and locust, growing upon their own roots, should be cut off close to the ground and allowed to spring up again, allowing only one strong shoot to grow.

Since no department of the station has hitherto been specially charged with the investigation of these creatures, experience in protecting against them has been largely confined to mechanical devices around the trunks of valuable orchard trees. A woven wire cylinder of rather small mesh, about eighteen inches or two feet high, has given good results.

The Minnesota Experiment Station says that some experienced tree-growers recommend the following treatment as protection against rabbits and mice:

Make a thick whitewash, about the consistency of cream, to which add enough blue vitriol to give a "robin's egg blue" color. Pass between two rows and apply with a brush, coating that side of each row which is next to the operator.

Another remedy recommended is to make a poisonous solution, using one part of sulphate of strychnine, one-third of one part of borax, one part of white syrup, ten parts of water.

This mixture is put into a large, wide-mouthed bottle and well shaken. Now cut fresh twigs from the kind of trees that are being attacked and with a small brush paint them lightly with the poison, especially the terminal buds. These are said to kill mice and rabbits without endangering birds and other animals. Scatter in runways frequented by the rodents.

Mice may also be killed with strychnine, powdered on corn meal mush. Wheat or corn may be soaked for twenty-four hours in a strychnine solution, made by boiling a teaspoonful of the crystals in two quarts of water, the grain, when dried, to be scattered at the bases of the trees.

H. A. GOSSARD,
Entomologist, Ohio Experiment Station.

MISREPRESENTATIONS OF TREE AGENTS.

The Ohio Experiment Station has recently received several letters similar to the following:

"Tree agents are working in this vicinity selling black locusts at $25 per 100. They claim that the trees will grow to post size in four to six years. They also claim that the trees they are selling will not sprout from the root and that it will be necessary to keep live-stock away from the young trees."

We are also in receipt of many inquiries as to the advisability of planting locust trees along the line of fences to serve as live posts.

Reliable nurseries in Ohio are cataloguing black locust trees at $6 to $10 per 1000. Locust trees will not ordinarily grow to post size in less time than eight to twelve years from planting. They will not sprount from the roots so long as the trees are uncut or uninjured and the roots unbroken, but as soon as the trees are cut or seriously injured or the roots broken, sprouts will come up from the roots. So far as is known all black locust trees are alike in this respect and any claim that they will never sprout is either made through ignorance or for the purpose of deceiving.

Live-stock, and especially sheep, are almost sure death to young locust trees, if allowed to pasture where they are growing.

It is not advisable to plant locust trees along the line of fences adjacent to tillable land, because of the fact that the sprouts which grow from the roots will, in most cases, become a nuisance. The trees will also be more liable to injury from live-stock, as it is not practicable to fence the trees in. In most cases the trees would of necessity be planted in sod and thus would receive no cultivation. The growth under such conditions would be slow at the best, and the grass would encourage the presence of mice which are very destructive to young locust trees.

Doubleday, Page & Co. have announced a new magazine, entitled "American Farming," the first number to appear February 1, 1906. The make-up of the magazine is to be along the same lines successfully carried out in "Country Life in America" and "Gardening," and the same high standard is to be maintained. The aid of a large number of experts in various lines of farming has been enlisted in the task of making this magazine really necessary to the farmer. One dollar a year is the subscription price, which places it within reach of all. There is a field for a really good agricultural magazine and we wish "American Farming" success.

JOHN P. STREEPER.

John P. Streeper, for many years an active member of the Columbus Horticultural Society, died October 26, in his 80th year. He was always an ardent lover of horticulture. For years there stood on the old home farm in Eastern Pennsylvania choice apple trees, monuments to his zeal and skill in grafting while he was yet a mere boy. By the death of his father in childhood, much of the planning and successful execution of the farm work fell upon him and a younger brother.

Through the years of his apprenticeship to the blacksmith's trade his interest in fruits and gardening never grew less. Later, when employed as blacksmith for a railroad in Virginia, and still later, as foreman in the Milwaukee and St. Paul's shops in Milwaukee, his favorite recreation was to take long walks to see someone's fine orchard or garden.

JOHN P. STREEPER

His ambition was to have a farm and garden of his own, and the time came when his ambition was realized in a farm in Ross county, Ohio.

In his later years, when a farm became too much for his declining strength, a garden still absorbed his interest. Wherever he lived there was a garden in which he passed the leisure time he had from other business, and but three days before his death, he busied himself preparing for winter the plants he had so carefully tended all summer around the home of his daughter, at Lancaster, Ohio.

As a member of the society he was one of the most active and regular in attending the meetings, and the reports of his experiences and work with plants was always intensely interesting and instructive.

The demand for foresters is increasing rapidly, both for state work and with private owners. Many states now have forest commissions, and several of them have state foresters. A trained forester at $2400 a year and two assistant foresters at $1200 each are wanted by California. Wisconsin wants an assistant forester at $1500, Indiana a forester to take charge of its state reserve, and Washington offers $1800 a year for a trained forester. In many other states the advisability of creating the office of state forester has been under discussion this year, and it is only a matter of a few years when such an official will be considered a regular part of an efficient state government.

The demand for foresters by private timber owners is growing at a still more rapid rate. During the last twelve months seven of the Bureau of Forestry force have left to take up work with such owners, and four have accepted public positions—two with Massachusetts, one with Connecticut and the fourth with Ontario, Canada. A number of other requests from private owners cannot be met because men are not available. The year before there were less than half as many applications for trained men. But the demand for trained specialists in this line has only begun.

Large lumber companies, great wood manufacturing concerns, owners of extensive forests, railroad companies and others are taking a hitherto unknown practical interest in conservative forestry. They must have expert men to control their holdings. The result is that forestry is very rapidly taking its place as a recognized profession. A number of forest schools are training young men for this work, but the demand has outrun the supply.

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